IDAHO
DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION
Job Performance Report
Project F-71-R-17

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 3-a.	Region 3 (McCall) Mountain Lakes Investigations
Job No. 3-b[1].	Region 3 (McCall) Lowland Lakes and Reservoirs Investigations
Job No. 3-b[2].	Region 3 (McCall) Lowland Lakes and Reservoirs Investigations - Cascade Reservoir Creel Census; Final Results
Job No. 3-c.	Region 3 (McCall) Rivers and Streams Investigations
Job No. 3-d.	Region 3 (McCall) Technical Guidance
Job No. 3-e.	Region 3 (McCall) Salmon and Steelhead Investigations

BY

Paul J. Janssen, Regional Fishery Biologist
Donald R. Anderson, Regional Fishery Manager
Joel J. Patterson, Fishery Technician

IDFG 94-5
May 1994

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

LIST OF FIGURES

Job No. 3-d. Region 3 (McCall) Technical Guidance

LIST OF TABLES

Job No 3-e Region 3 (McCall) Salmon and Steelhead Investigations

JOB PERFORMANCE REPORT

State of: Idaho Name: Regional Fisheries Management Investigations

Project: F-71-R-17 Title: Region 3 (McCall) Mountain Lakes Investigations

Job No.: 3 (Mc)-a

Period Covered: July1, 1992 - June 30. 1993

ABSTRACT

Several mountain lakes have been stocked with brown trout (Salmo trutta), since 1987, in an attempt to control "stunted" brook trout (Salvelinus fontinalis) or to provide a diversity in fishing opportunity. In 1992, seven of these lakes (Deep, Rapid, Trail, Anderson, Skein, Blackwell, and Snowslide) were sampled by Idaho Department of Fish and Game personnel to determine the effects of these plants. All but Rapid, Skein, and Blackwell lakes were stunted brook trout control attempts. In addition to the experimentally stocked lakes mentioned above, three other mountain lake were sampled in 1992: Kennally #1; Summit; and Thirty-three.

Relative weights (W_r) of brook trout were used to compare populations before, during, and after brown trout introductions. Brown trout were found in only two of the lakes sampled in 1992: Deep and Skein. Since the beginning of the study, there have been significant changes in W_r of brook trout in two lakes: Deep and Rapid. Brook trout W_r in Deep Lake improved from 44 in 1988 to 72 in 1992 and decreased in Rapid Lake from 105 in 1989 to 72 in 1992.

Brown trout had little or no effect on stunted brook trout populations in any of the lakes sampled. While Deep Lake showed significant improvement in brook trout W_r, it is not likely that brown trout were responsible. Most of the improvement in relative weights in Deep Lake brook trout occurred between 1988 and 1989 (from 44 to 72). At that time, brown trout averaged only 195 mm, which is probably too small to make an impact on the brook trout population through predation. The effects of drought, fishing pressure, and changes in age class structures are all unknown on all of these lakes. Reasons for the decline in brook trout W_r in Rapid Lake are unknown. As W_r decreased significantly, average length and weight increased significantly.

While brown trout did not appear to be the answer to control stunted brook trout populations, they could be used for species diversity in mountain lakes. They performed adequately in lakes where there were no stunted brook trout, with conditions factors over 1.0. While not examined, the lower catchability usually associated with brown trout might be beneficial in mountain lakes in high traffic areas. Brown trout stocked in such locations might survive longer and grow larger, therefore providing more opportunity, compared to usual rainbow trout (Oncorhynchus mykiss) and cutthroat trout (Oncorhynchus clarki) stockings in high traffic areas. They may also be useful in pulling pressure away from some areas by attracting fishermen seeking to catch brown trout.

Trout were collected in all three of the other mountain lakes examined. In Thirty-three Lake, 25 rainbow trout of several age classes were collected, averaging 254 mm and 160 g, with an average K_{tl} of 0.86. In Kennally Lake #1, one age class of cutthroat trout was collected. These fish averaged 362 mm and 554 g, with an average K_{tl} of 1.16. A stunted brook trout population was found in Summit Lake. A total of 20 fish were collected, all brook trout. These fish averaged 229 mm and 103 g, with a W_r value of 65.

Authors:

Paul J. Janssen
Regional Fishery Biologist

Joel J. Patterson
Fishery Technician

INTRODUCTION

Several mountain lakes have been stocked with brown trout (Salmo trutta), since 1987, in an attempt to control "stunted" brook trout (Salvelinus fontinalis) or to provide a diversity in fishing opportunity. In 1992, seven of these lakes: Deep Lake (09-0406); Anderson Lake (09-0336); Trail Lake (09-0403); Rapid Lake (09-0312); Skein Lake (09-274); Blackwell Lake (09-366) and Snowslide Lake (09-0355), were sampled by Idaho Department of Fish and Game personnel to determine the effects of these plants. All but Rapid, Skein, and Blackwell lakes were stunted brook trout control attempts.

In addition to the lakes mentioned above, three other mountain lakes were sampled in 1992: Kennally Lake #1 (09-0298); Summit Lake (07-0410); and Thirty-three Lake (07-0468). The recent stocking records of the seven brown trout-stocked lakes are presented in Table 1 and the stockings records of the other three lakes are presented in Table 2.

Table 1. Recent stocking histories of the seven lakes surveyed in 1992 which have been experimentally stocked with fingerlings and/or catchable size brown trout.

Lake	Year	Species	Size	Number	Number/Hectare
Deep	1987	BRN	fingerling	1,000	83
	1988	BRN	fingerling	1,005	83
	1989	BRN	catchables	846	70
Rapid	1985	RBT	catchables	1,313	268
	1986	RBT	catchables	200	41
	1987	BRN	fingerling	1,500	306
	1987	CT	fry	1,000	204
	1988	BRN	fingerling	1,005	205
	1989	BRN	catchables	410	84
Trail	1988	BRN	fingerling	1,005	112
	1989	BRN	catchables	564	63
Anderson	1985	RBT	catchables	1,100	275
	1986	RBT	catchables	1,008	252
	1987	RBT	catchables	990	248
	1989	BRN	catchables	494	124
Snowslide	1987	RBT	fry	1,000	208
	1989	BRN	catchables	564	117
Skein	1988	BRN	fingerling	2,000	285
	1988	CT	fry	1,000	143
	1991	CT	fry	1,000	143
Blackwell	1986	RBT	fry	500	20
	1987	RBT	fry	700	29
	1988	RBT	fry	500	20
	1989	BRN	catchables	1,100	45
	1990	RBT	fry	700	29
	1991	RBT	fry	500	20

Table 2. Recent stocking histories of three mountain lakes in the McCall Subregion.

Lake	Year	Species	Size	Number	Number/Hectare
Kennally #1	1986	R4	1	500	
	1989	C2	1	500	
33 Lake	1988	C2	1	500	
	1991	C2	1	500	
Summit Lake	None	--	-	---	

METHODS

All ten mountain lakes were sampled with 150 foot diving experimental gill nets. Each net was set during the day, using a small inflatable boat, and pulled the following morning. Fish collected were identified, measured (total length) to the nearest millimeter, and weighed to the nearest 5 g.

Data obtained from the gill netting was then used to calculate mean length, weight, relative weight (W_r), and condition factor (K_{tl}). Confidence intervals (95%) for the means were computed as well.

A relative weight (W_r) index was used to evaluate the health of the brook trout population in a given lake, before and after the treatment of brown trout stocking. Using W_r removed the bias of changing K_{tl} with different lengths of fish, ie., smaller trout typically have a poorer K_{tl} than do larger specimens from the same population.

An optimum length/weight equation (log W_s) was generated from data obtained from brook trout reared under ideal hatchery conditions (Cooper 1961, in Carlander 1969):

$$\log W_s = -5.26 + 3.15 \log L$$

The lengths of brook trout collected were then used to generate a length-specific standard weight (W_s). W_s values were then used in the relative weight (W_r) index equation (Nielsen and Johnson 1983):

$$W_r = (W / W_s) * (100)$$

$$W = \text{sampled brook trout weight in grams}$$

The value obtained from this equation was then compared to 100 as an indication of overall condition. As described by Nielsen and Johnson (1983), a mean relative weight (W_r) value of 100 for a broad range of size groups may reflect ecological and physiological optimums for populations. When mean (W_r) values are well below 100 for a size group, problems may exist in food and feeding relationships. Also, when mean (W_r) values are well above 100 for a size group, fish may not be making the best use of available food resources (Nielsen and Johnson 1983).

The mean (W_r) values, with 95 percent confidence intervals, were then graphed to determine if there was any improvement in the condition of the brook trout populations over the years in the brown trout-stocked mountain lakes.

RESULTS

Brown trout were collected in only two of the lakes sampled in 1992: Deep Lake and Skein Lake (Table 4) (two fish in each). Throughout the duration of the study, there were significant changes in W_r of brook trout in only two lakes: Deep and Rapid (Figure 1).

Of the four stunted brook trout study lakes (Deep, Anderson, Trail, and Snowslide), only Deep Lake showed any improvement (Table 4). Brook trout W_r in Deep Lake improved from 44 in 1988 to 72 in 1992. Trail Lake brook trout lengths and weights improved significantly from 1989 to 1992. Relative weights and condition factors did not change. Brook trout in Anderson Lake also improved in length and weight, but did not improve in relative weight. Brook trout in Snowslide Lake had a relative weight value of 74 in 1992 (the only year sampled).

An unexpected finding during the study was the significant drop in relative weights in the brook trout population in Rapid Lake. Relative weights decreased in Rapid Lake, from 105 in 1989 to 72 in 1992. No brown trout were collected from Rapid Lake in 1992; however, there were reports of angler catches of brown trout.

Fish were found in all three of the non-experimental lakes that were sampled (Table 3). Summit Lake contained a stunted brook trout population. A total of 20 were collected with average length, weight, and W_r values of 229 mm, 103 g, and 65, respectively.

Table 3. Statistics of fish gill netted from three different high mountain lakes in 1992 (95% Confidence Intervals).

Lake	Species	Sampled	$\bar{X}$TL	$\bar{X}$WT	$\bar{X}W_r$	$\bar{X}K_{tl}$
Summit	BRK	20	229 (12)	103 (12)	65 (3.9)	.85 (.05)
33 Lake	RBT	25	254 (23)	160 (47)	N/A	.86 (.05)
Kennally #1	CT	7	362 (19.5)	554 (110)	N/A (0.12)	1.16

In Thirty-three Lake, a total of 25 rainbow trout (Oncorhynchus mykiss) were collected, with average lengths and weights of 254 mm and 160 g, respectively. Fish lengths and weights ranged from 173 mm to 377 mm and 50 g to 490 g, with many fish between these ranges, indicating several age classes. The mean K_{tl} was 0.86. Lake trout (Salvelinus namaycush) are known to exist in Thirty-three Lake, but none were collected.

Kennally Lake #1 contained large cutthroat trout (Oncorhynchus clarki) with average lengths, weights, and K_{tl} of 362 mm, 554 g, and 1.16, respectively. A total of seven fish were collected, all of which appeared to be of the same age class (stocked as fry in 1989, Table 2).

Table 4. Statistics of fish captured in seven experimental brown trout-stocked lakes in 1988, 1989, 1990, and 1992 (95% Confidence Intervals).

Lake	Species	Year Sampled	Number Sampled	$\bar{X}$TL	$\bar{X}$WT	$\bar{X}W_r$	$\bar{X}K_{tl}$
Deep	BRK	88_1	44	207	55	44	.56
				(9)	(9)	(3)	(.03)
	BRN	88	4	195	36	N/A	.49
				(12)	(12)		(.11)
	BRK	89	99	181	55	64	.80
				(7)	(6)	(3)	(.02)
	BRN	89	2	185	60	N/A	.95
	BRK	90_1	40	215	86	64	.82
				(7)	(10)	(2)	(.02)
	BRN	90	7	275	200	N/A	.93
				(20)	(51)		(.05)
	BRK	92_2	14	228	114	72	.94
				(11.5)	(16)	(5)	(.06)
	BRN	92	2	262	165	N/A	.94
Rapid	BRK	89_1	31	214	154	105	1.34
				(21.5)	(41)	(7.5)	(.08)
	BRN	89	1	190	90	N/A	1.30
	BRK	90_2	32	272	269	88	1.17
				(21)	(53)	(4)	(.05)
	BRN	90	2	285	260	N/A	1.10
	BRK	92_3	19	298	288	72	.99
				(26)	(67)	(2)	(.03)
Trail	BRK	89	29	182	73	76	.95
				(22)	(26)	(5)	(.07)
	BRK	90_1	28	190	72	80	1.02
				(9)	(9)	(4)	(.04)
	BRN	90	1	300	325	N/A	1.20
	BRK	92_2	16	233	128	74	.97
				(15)	(28)	(2)	(.02)
Anderson	BRK	89	41	180	61	71	.89
				(13)	(15.5)	(2)	(.07)
	BRK	90	26	216	89	66	.85
				(7)	(10.5)	(3)	(.03)
	BRN	90	8	232	98	N/A	.77
				(16.5)	(19)		(.04)
	BRK	92	14	237	123	68	.89
				(17.5)	(25)	(4)	(.04)
Snowslide	BRK	92	25	219	108	74	.95
				(15)	(21)	(1)	(.02)
Skein	RBT	89	1	210	110	N/A	1.19
	CT		22	134	32		1.12
				(17.5)	(18)		
	BRN		29	178	74	N/A	1.00
				(32)	(24)		(.07)
	RBT	92	1	280	205	N/A	.93
	CT		1	342	405	N/A	1.01
	BRN		2	307	287	N/A	1.00
Blackwell	RBT	92	35	252	165	N/A	.98
				(15)	(24)		(.05)
	KOK		2	241	132	N/A	.85
	RB/CT		4	315	313	N/A	.96
				(93)	(205)		(.14)

Note: Years denoted by different subscripts show significant differences in mean relative weights (W_r) of brook trout populations analogous to that particular lake.

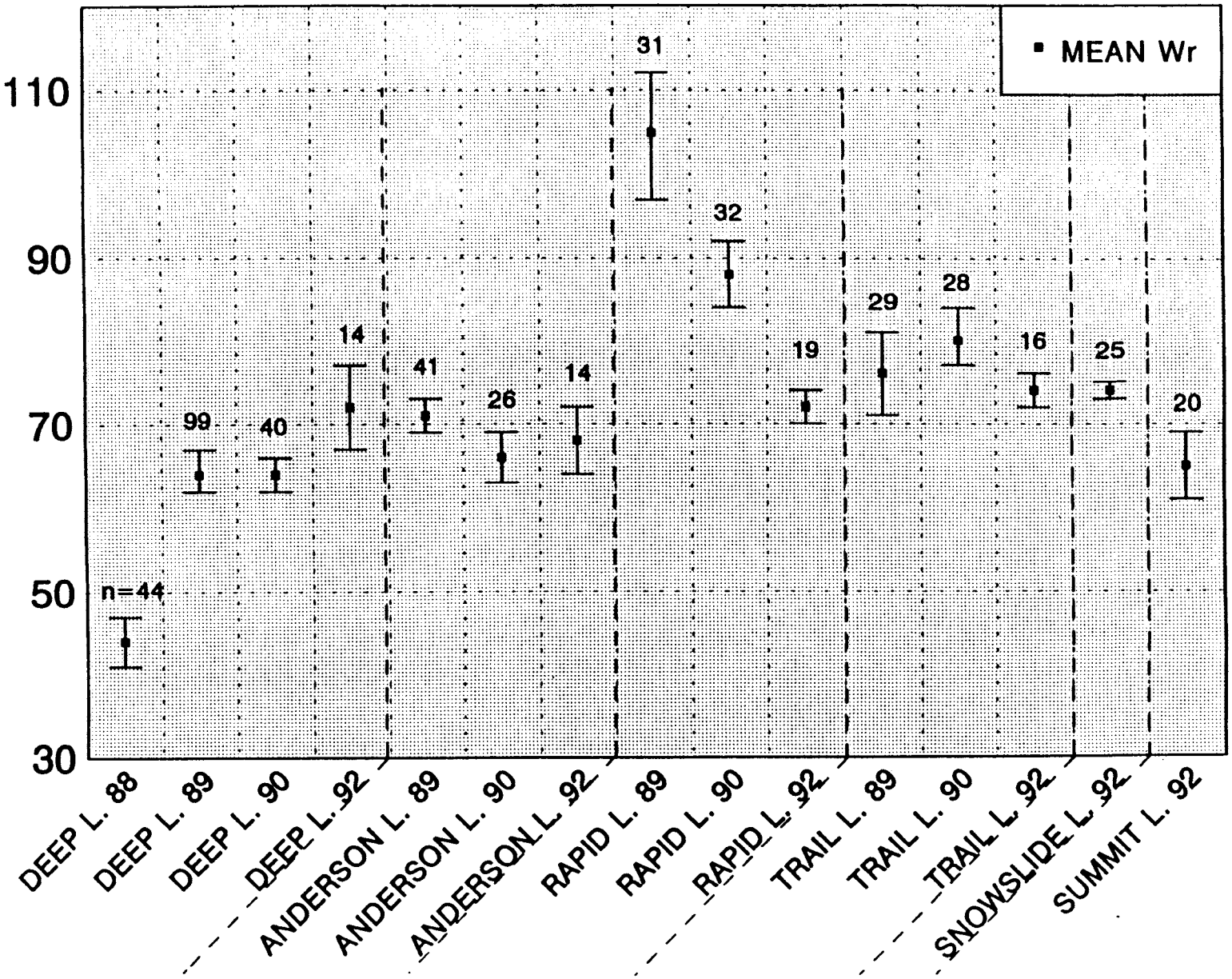

Figure 1. Relative weights (W_r) of brook trout in various mountain lakes sampled from 1988 through 1992.

DISCUSSION

Results of the experimental brown trout stockings were not encouraging and were somewhat unclear. There was a significant improvement from 1988 to 1992 in overall K factors and the mean relative weight of brook trout in Deep Lake. Most of the improvement occurred between 1988 and 1989 (from 44 to 72). At that time, brown trout averaged only 195 mm, too small to make an impact on the brook trout population through predation. It appeared that something else was responsible for the change in relative weights. The reasons for this might include: collection techniques; changes in fishing pressure; or a loss of year classes due to changes in spawning habitat conditions as a result of the current drought.

The other three lakes where stunted brook trout control attempts were made with brown trout showed no significant changes or improvements in relative weights. However, the brook trout in all of these lakes grew in length and weight. Since no population age structure work was done in the early sampling, it was difficult to tell exactly what happened. Also, we had no quantitative data on changes in fishing pressure on these lakes. It appears that, due to the recent severe drought, fishing pressure had increased significantly on mountain lakes.

While brown trout are not the answer to control stunted brook trout populations, they could be used for species diversity in mountain lakes. They performed adequately in lakes where there were no stunted brook trout, with conditions factors generally over 1.0. While not examined, the lower catchability usually associated with brown trout might be beneficial in mountain lakes in high traffic areas. Brown trout stocked in such locations might survive longer and grow larger, therefore providing more opportunity, compared to the usual rainbow trout and cutthroat trout stockings in high traffic areas. They may also be useful in attracting fisherman seeking to catch brown trout.

RECOMMENDATIONS

1. Continue to collect mountain lake fishery information for general fishery management.
2. Continue to pursue ways of controlling stunted brook trout populations.
3. Continue with species diversity program.
4. Continue working with the Payette National Forest personnel collecting baseline fishery and habitat data in alpine lakes.

LITERATURE CITED

Carlander, K.D. 1969. Handbook of Freshwater Fishery Biology. Volume One. Iowa State University Press. 752 pp.

Grunder, S.A., J.D. Linman, and D.R. Anderson. 1990. Federal Aid in Fish Restoration. Regional Fishery Management Investigations, Job Performance Report, Project F-71-R-13. Idaho Department of Fish and Game, Boise.

Grunder, S.A., J.D. Linman, and D.R. Anderson. 1991. Federal Aid in Fish Restoration. Regional Fishery Management Investigations, Job Performance Report, Project F-71-R-14. Idaho Department of Fish and Game, Boise.

Janssen, P.J. and D.R. Anderson. 1992. Federal Aid in Fish Restoration. Regional Fishery Management Investigations, Job Performance Report, Project F-71-R-15. Idaho Department of Fish and Game, Boise.

Nielsen, L.A. and D.L. Johnson. 1983. Fisheries Techniques. American Fisheries Society. 468 pp.

Scully, R., and D.R. Anderson. 1987. Federal Aid in Fish Restoration. Regional Fisheries Management Investigations. Job Performance Report. Project F-71-R-11. Idaho Department of Fish and Game, Boise.

Scully, R., and D.R. Anderson. 1989. Federal Aid in Fish Restoration. Regional Fisheries Management Investigations. Job Performance Report. Project F-71-R-12. Idaho Department of Fish and Game, Boise.

Weaver, P. 1992. 1989/1990 High Mountain Lakes Survey. Payette National Forest. McCall District.

JOB PERFORMANCE REPORT

State of: Idaho Name: Regional Fishery Management Investigations

Project: F-71-R-17 Title: Region 3 (McCall) Lowland Lakes and Reservoirs Investigations

Job No.: 3(Mc)-b[1]

Period Covered: July1, 1992 to June 30, 1993

ABSTRACT

Payette Lake

Management programs undertaken in 1992 focused primarily on kokanee (Oncorhynchus nerka kennerlyi) standing crops and, to a limited degree, on lake trout (Salvelinus namaycush) tagging.

In 1991, problems were encountered aging hatchery-origin kokanee captured in the midwater trawling effort. Therefore, in 1992, all hatchery-stocked kokanee were marked with an adipose fin clip. A total of 130,530 adipose-clipped age 0+ kokanee were stocked in May 1992.

Kokanee were sampled in Payette Lake on September 22 and 23, 1992 with a midwater trawl. All kokanee captured were checked for an adipose fin clip, which indicated a fish stocked in 1992 from Mackay Fish Hatchery.

Lake trout have been captured by hook and line by volunteer fishermen throughout the spring and summer months since 1988. These fish were tagged with $5.00 reward cinch-up spaghetti tags. No lake trout were tagged in 1992. However, all recaptures by anglers in 1992 were recorded.

Estimated abundance of wild age 0+ kokanee in Payette Lake in September 1992 was 202,240 fish. The estimate of wild age 1+ kokanee was 30,887 fish, and there were an estimated 19,774 age 0+ hatchery kokanee. The size of hatchery age 0+ kokanee averaged slightly smaller than age 1+ wild kokanee, but the ranges overlapped. Lengths of hatchery age 0+ fish ranged from 90 mm to 190 mm and lengths of wild age 1+ ranged from 170 mm to 220 mm.

Of interest is the fact that the age 0+ fish collected in 1988 are the parents of the 1992 age 0+ cohort. Since there are now five continuous years of trawling data, specific cohorts could be tracked to look at stock recruitment. The 1988 cohort (age 0+ in 1988), with an estimated population size of 74,800 fish, survived to produce a spawning run of around 20,800 fish. These fish spawned and produced 202,240 age 0+ fish in 1992. For each age 0+ fish present in the lake in 1988, 2.7 age 0+ fish were produced in 1992. For every spawner in 1988 (1985 cohort), an estimated 1.4 progeny survived to spawn in 1992. A problem in tracking these cohorts is the unknown percentage of wild fish produced from spawning hatchery-origin fish.

The harvest exploitation rate of lake trout in 1992 was 4 to 5 percent. Catch-and-release exploitation was approximately 3.5 percent. These estimates were made using some assumptions that are intuitively erroneous. These include 100 percent tag return rate, 100 percent tag retention, and 100 percent survival of tagged fish. Therefore, the estimates made are minimums. Lengths and weights of fish caught ranged from 53.3 cm and 2.0 kg to 91.4 cm and 10.4 kg.

Rainbow Trout "Put-and-Take" Evaluations

Both Brundage and Horsethief reservoirs have "put-and-take" rainbow trout (Oncorhynchus mykiss) programs. Brundage Reservoir received an annual quota of 5,000 fish, with a one-time plant shortly after ice-out. Horsethief Reservoir gets two stockings per year -- one of 10,000 fish in May, and another of 5,000 fish in October.

To justify these stockings, the five-year fisheries management plan calls for an average return of 40 percent by number, or 100 percent by weight of these fish. Therefore, in 1992, the put-and-take rainbow trout stockings in the two above mentioned reservoirs were evaluated.

In Brundage Reservoir, a total of 300 $5.00 reward tags were placed on 300 of the 5,000 put-and-take rainbow trout stocked in the reservoir. A total of 29 tags were returned, for an estimated return-to-the-creel of put-and-take rainbow trout of 9.6 percent. Tags were returned from mid-June through mid-November.

In Horsethief Reservoir, a total of 300 $5.00 reward tags were placed on 300 of the 10,000 put-and-take rainbow trout stocked in May 1992. No tags were placed on the second plant of 5,000 fish in October. A total of 116 tags were returned, for an estimated return-to-the-creel of put-and-take rainbow trout of 38.7 percent.

Tag returns will continue to be monitored, so the above return rates are minimums.

Hells Canyon Reservoirs

In 1992, a smallmouth bass (Micropterus dolomieu) regulation change went into effect for Oxbow Reservoir. The new regulation is a protected slot of 12 to 16 inches, with a daily limit of two fish out of the slot. Also, no harvest of any bass is allowed until July 1.

In order to evaluate the effects of the new regulation, baseline data was collected on Oxbow and Hells Canyon reservoirs in 1992 and again in 1993. Data from Hells Canyon was used as a control to further assess any changes in the smallmouth bass population structure due to the regulation change.

In addition to the data collection described above, standard lowland lakes surveys were performed on both Hells Canyon and Oxbow reservoirs. Both reservoirs were electrofished, gill netted, and trap netted to complete the lowland lakes standard surveys. See the April 8, 1992 intradepartmental memo on Lowland Lakes Standard Surveys for description and methodology.

To help complete the baseline data collection, a creel census was also conducted on the reservoirs. Beginning in April, three weekend days and four weekdays were randomly chosen for each month. A random count time was then selected for each day. One count was made at that time on each creel day. Counts were made of individual shore and boat anglers.

In addition to the creel census, the electrofishing effort was repeated in 1992, in conjunction with personnel from the Oregon Department of Fish and Wildlife.

A standard survey was completed on both Hells Canyon and Oxbow reservoirs on May 4-6, 1992. The most abundant species of fish by number in both reservoirs were smallmouth bass, at 164 and 279 caught/unit effort (cpue), respectively. In biomass, the most abundant species in Hells Canyon Reservoir was carp (Cyprinus carpio) at 33.2 kg cpue, and in Oxbow it was the smallmouth bass at 47.72 kg cpue.

In both reservoirs, black crappie (Pomoxis nigromaculatus) had the highest relative weight of all game fish present. Smallmouth bass and channel catfish (Ictalurus punctatus) had the poorest relative weights of all game fish present.

The creel survey completed on Oxbow Reservoir started April 1, 1992 and ran through December 31, 1992.

The total angling pressure estimate for April through December 1992 was 22,785 boat angler hours (15.2 hrs/surface acre) and 22,595 shore angler hours (15.1 hrs/surface acre).

The best overall harvest rates were recorded during the month of August, with 2.40 and 3.78 fish/hour for weekdays and weekends, respectively (Table 10). The best harvest rate recorded was on weekdays in June, when the average harvest rate was 3.90 fish/hour.

The month of June had the highest total harvest, with 19,484 fish, even though this only included shore anglers (no boat interviews were completed in June).

Total harvest was estimated at 67,071 fish. The total estimated number of fish caught and released was 21,122.

Smallmouth bass harvest was minimal under the new regulation. An estimated 616 smallmouth bass less than 12 inches were harvested from July 1 through December 31, 1992. Through the entire period of the creel survey, an estimated 9,983 smallmouth bass less than 12 inches and 454 smallmouth bass from 12 to 16 inches were caught and released.

No smallmouth bass over 16 inches were observed during the creel survey and none were reported caught and released.

An estimated 455 smallmouth bass in the 12 to 16-inch protected slot range were caught and released during the creel survey.

Of all the parties interviewed, 58 percent were Oregon residents, 31 percent were Idaho residents, and the remaining 11 percent were from other states.

Lost Valley Reservoir

Lost Valley Reservoir was chemically treated in the fall of 1991 to remove an unwanted population of "stunted" yellow perch (Perca flavescens). To determine the success of that treatment, the reservoir was gill netted on April 10, 1992.

Six gill nets were placed in Lost Valley Reservoir on the evening of April 9, 1992. The nets were allowed to fish overnight and then pulled the next morning.

A total of 62 fish were collected in the gill nets. Of these, 39 were yellow perch ranging in size from 105 mm to 197 mm. When the nets were pulled, yellow perch eggs were found on the nets, indicating the presence of sexually mature fish. In addition to the yellow perch, 22 brook trout (Salvelinus fontinalis) and 1 bridgelip sucker (Catostomus columbianus) were collected.

Upper Payette Lake and Brundage Reservoir

Upper Payette Lake was scheduled for an introduction of splake (lake trout x brook trout hybrid) in the fall of 1992. Therefore, some baseline data was required to evaluate the effects of that introduction on the Upper Payette Lake fishery.

Brundage Reservoir is a special regulation "trophy" water that had failed to produce any large fish in the last couple of years. This water has in the past produced some large rainbow trout (2 to 3 lbs). There were also complaints of anglers catching only small fish. Therefore, fishery data was collected in the reservoir in 1992. In 1991 and 1992, Brundage Reservoir received 30,000 rainbow trout fingerling, in addition to the 5,000 rainbow trout put-and-take fish mentioned previously in this report in the "Rainbow Trout Put-and-Take Evaluation" section.

Upper Payette Lake was netted on June 25, 1992. Four standard experimental gill nets, two floating and two diving, were set on June 25, 1992 and fished overnight.

On Brundage Reservoir, three standard experimental gill nets were set on May 26, 1992. Of the three nets, two were divers and the other a floating net. The nets were fished all night and pulled the next morning. In 1990, the 25,840 fingerling stocked in Brundage Reservoir were adipose-clipped to give us a way to accurately age this stocking when collected.

Of the 317 fish collected in nets at Upper Payette Lake, 263 were largescale suckers (Catostomus macrocheilus), 32 were rainbow trout, and 22 were brook trout.

Splake were stocked in Upper Payette Lake in September 1992.

Of the 173 rainbow trout collected in Brundage Reservoir, 34 had an adipose clip. The size of fish collected ranged from 160 mm to 310 mm. The adipose clipped fish ranged in size from 180 mm to 284 mm, and averaged 249 mm. These fish were approximately 114.3 mm (4.5 in) when stocked in July 1990. This equated to an annual growth rate of 67 mm (2.6 in) per year.

Fish stocked in 1991 and collected in 1992 averaged 183 mm (7.2 in). These fish were stocked at 4.0 inches in 1991. This equates to an annual growth rate of 81.3 mm (3.2 in) per year.

The Brundage Reservoir rainbow trout population was affected from intra-specific competition. Growth rates should have been double of that observed. Therefore, the fingerling plant scheduled for 1992 was canceled, as was the stocking scheduled for 1993. The fishery should be evaluated again in 1993. Once the population of small mature rainbow trout has been removed, fingerling stockings should be continued, but at a much reduced rate.

Authors:

Paul J. Janssen
Regional Fishery Biologist

Donald R. Anderson
Regional Fishery Manager

OBJECTIVES

To maintain information for fishery management activities and decisions for lowland lakes and reservoirs.

INTRODUCTION

Payette Lake

Payette Lake was previously described by Grunder et al. (1990a). Management programs undertaken in 1990 focused primarily on kokanee (Oncorhynchus nerka kennerlyi) standing crops and, to a limited degree, on lake trout (Salvelinus namaycush) tagging.

In 1991, problems were encountered aging hatchery-origin kokanee captured in the midwater trawling effort (Janssen and Anderson 1994). Therefore, in 1992, all hatchery-stocked kokanee were marked with an adipose fin clip.

Rainbow Trout Put-and-Take Evaluations

Both Brundage and Horsethief reservoirs have put-and-take rainbow trout (Oncorhynchus mykiss) programs. Brundage Reservoir gets an annual quota of 5,000 fish, with a one-time plant shortly after ice-out. Horsethief Reservoir receives two stockings per year -- one of 10,000 fish in May, and another of 5,000 fish in October.

To justify these stockings, the five-year fisheries management plan calls for an average return of 40 percent by number or 100 percent by weight of these fish. Therefore, in 1992, the put-and-take rainbow trout stockings in the two above mentioned reservoirs were evaluated.

Hells Canyon Reservoirs

In 1992, a smallmouth bass (Micropterus dolomieu) regulation change went into effect for Oxbow Reservoir. The new regulation is a protected slot of 12 to 16 inches with a daily limit of two fish out of the slot. Also, no harvest of any bass is allowed until July 1.

In order to evaluate the effects of the new regulation, baseline data was collected on Oxbow and Hells Canyon reservoirs in 1992 (Janssen and Anderson 1994) and again in 1993. Data from Hells Canyon was used as a control to further help assess any changes in the smallmouth bass population structure due to the regulation change.

In addition to the data collection described above, standard lowland lakes surveys were performed on both Hells Canyon and Oxbow reservoirs.

Lost Valley Reservoir

Lost Valley Reservoir was chemically treated in the fall of 1991 to remove an unwanted population of "stunted" yellow perch (Perca flavescens) (Janssen and Anderson 1994). To determine the success of that treatment, the reservoir was gill netted on April 10, 1992.

Upper Payette Lake and Brundage Reservoir

Upper Payette Lake was scheduled for an introduction of splake (lake trout x brook trout [Salvelinus fontinalis] hybrid) in the fall of 1992. Therefore, some baseline data was required to evaluate the effects of that introduction on the Upper Payette Lake fishery.

Brundage Reservoir is a special regulation "trophy" water that had failed to produce any large fish since it became a trophy water. It has in the past produced large rainbow trout (2 to 3 lbs). There were also complaints by anglers of catching only small fish. Therefore, fishery data was collected in the reservoir in 1992. In 1991 and 1992, Brundage Reservoir received 30,000 rainbow trout fingerling in addition to the 5,000 rainbow trout put-and-take fish mentioned above in this report in the "Rainbow Trout Put-and-Take Evaluation" section.

METHODS

Payette Lake

Kokanee were sampled in Payette Lake on September 22 and 23, 1992 with a midwater trawl. Methodology for the trawling technique was as reported by Bowles et al. (1986, 1987) and Grunder (1990b). All kokanee captured were checked for an adipose fin clip, which indicated a fish stocked in 1992 from Mackay Fish Hatchery. A total of 130,530 adipose-clipped age 0+ kokanee were stocked in May 1992.

Lake trout have been captured by hook and line by volunteer fishermen throughout the spring and summer months since 1988. These fish were tagged with $5.00 reward cinch-up spaghetti tags. No lake trout were tagged in 1992. However, all recaptures by anglers in 1992 were recorded.

Rainbow Trout Put-and-Take Evaluations

In Brundage Reservoir, a total of 300 $5.00 reward tags were placed on 300 of the 5,000 put-and-take rainbow trout stocked in the reservoir.

In Horsethief Reservoir, a total of 300 $5.00 reward tags were placed on 300 fish of the 10,000 put-and-take rainbow trout stocked in May 1992. No tags were placed on the second plant of 5,000 fish in October.

Throughout the rest of the year, any tags that were returned were recorded. The percent of tags returned from the initial 300 tags put out equalled the percentage return to the creel of put-and-take trout.

When total returns of the tags were estimated, we erroneously assumed that all tags would be turned in. Therefore, the estimates given are an absolute minimum.

Hells Canyon Reservoirs

Both Hells Canyon and Oxbow reservoirs were electrofished, gill netted, and trap netted to complete the lowland lakes standard surveys. See the April 8, 1992 intradepartmental memo on Lowland Lakes Standard Surveys for description and methodology.

For the standard lowland lake survey, two 1/4-mile electrofishing transects were electrofished. The total amount of time electrofishing was recorded and all species encountered were collected. All fish were measured for total length and a sample of fish were weighed. Scales were collected from five fish from every 10 mm length increment from each species of fish collected. Similar data was recorded on fish collected from gill nets and trap nets. Scales were aged and annuli measured for length back-calculations.

A total of six nets (two standard diving experimental gill nets, two standard floating experimental gill nets, and two trap nets) were fished for one full night to complete the standard survey. This amount of effort equalled one "unit of effort" in each reservoir, as described in the memo cited above. The electrofishing effort was 8.75 minutes short of the full hour required in Hells Canyon Reservoir and 6.25 minutes short in Oxbow Reservoir. Data tabulations were all converted to catch/unit effort.

To help complete the baseline data collection needed to evaluate the effects of the regulation change on Oxbow Reservoir, a creel census was also completed.

Beginning in April 1992, three weekend days and four weekdays were randomly chosen for each month. A random count time was then selected for each day. One count was made at that time on each creel day. Counts were made of individual shore anglers and boats.

Angler interviews were conducted before and after the counts. Information collected during the interviews included: 1) number of anglers in party or boat; 2) length of time fished that day; 3) number and species of fish harvested; 4) number and species of fish caught and released; 5) number of bass less than 12 inches caught and released; 6) number of bass less than 12 inches harvested (after July 1, 1992); 7) number of bass caught and released in the 12 to 16-inch slot limit; and 8) number of bass more than 16 inches caught and released or harvested.

Creel data was entered into the Idaho Department of Fish and Game, Creel Census System, computer program (Reece et al. 1992).

In addition to the creel census, the electrofishing effort that was completed and described in Janssen and Anderson (1994) was repeated in 1992 in conjunction with personnel from the Oregon Department of Fish and Wildlife.

Smallmouth bass data collected in 1992 was summarized by Terry Schrader of the Oregon Department of Fish and Wildlife. Results of his age and growth data analysis are also presented in this report.

Lost Valley Reservoir

Six gill nets were placed in Lost Valley Reservoir on the evening of April 9, 1992. The nets were allowed to fish overnight and were pulled the next morning.

Upper Payette Lake and Brundage Reservoir

Upper Payette Lake was netted on June 25, 1992. Four standard experimental gill nets, two floating and two diving, were set on June 25, 1992 and fished overnight. The nets were pulled the next day. In addition to the gill nets, two trap nets were set on the same day, fished overnight, and pulled the next day.

On Brundage Reservoir, three standard experimental gill nets were set on May 26, 1992. Of the three nets, two were divers and the other a floating net. The nets were fished all night and pulled the next morning. In 1990, the 25,840 fingerling stocked in Brundage Reservoir were adipose-clipped. This gave us a way to accurately age this stocking.

RESULTS

Payette Lake

Kokanee Population Status

Estimated abundance of wild age 0+ kokanee in Payette Lake in September 1992 was 202,240 fish (Table 1). The estimate of wild age 1+ kokanee was 30,887 fish, and there were an estimated 19,774 age 0+ hatchery kokanee. The size of hatchery age 0+ kokanee averaged slightly smaller than age 1+ wild kokanee, but the ranges overlapped. Lengths of hatchery age 0+ fish ranged from 90 mm to 190 mm, and lengths of wild age 1+ ranged from 170 mm to 220 mm. An estimated 12.5 percent of the 1992 hatchery-stocked kokanee survived to the day of trawling.

Survival of the wild age 0+ 1991 cohort to age 1+ in 1992 was estimated at 24 percent. Estimated mean densities (fish/hectare) of age 0+ and 1+ were 118 and 18 fish/hectare, respectively (Table 1). This was a 157 percent increase in densities of age 0+ fish, and a 54 percent decrease for age 1+ fish, compared to the 1991 estimates.

Total kokanee biomass (hatchery and wild), not including adult fish (this year's spawners) was estimated at 1.7 kg/hectare. Total biomass, including 1992 spawner escapement estimates, was 9.7 kg/hectare. This biomass estimate includes very few fish more than 180 mm in length that did not spawn this year, due to inefficiencies in the trawl. Last year's trawling estimate of 1,187 age 2+ fish produced the largest spawning run ever recorded; run size was estimated at 37,000 fish. In addition to this estimate, there is a shoreline-spawning kokanee population, about which virtually nothing is known.

Lake Trout Population Status

A total of 152 lake trout have been tagged with reward tags since 1988. No fish were tagged in 1992 (Table 2). Of all the tagged fish, 16 are known dead through 1992. In 1992, one tagged fish was recaptured and released, and six fish were caught and killed. In addition, four fish were caught and released and the tags removed. Since 1988, a total of 16 tagged fish have been recaptured and killed, 17 have been caught and re-released, and four were released with the tag removed.

The harvest exploitation rate of lake trout in 1992 was 4 to 5 percent. Catch-and-release exploitation was approximately 3.5 percent. These estimates were made using some assumptions that are erroneous. These include 100 percent tag return rate, 100 percent tag retention, and 100 percent survival of tagged fish. Therefore, the estimates made are minimums. Lengths and weights of fish caught ranged from 53.3 cm and 2.0 kg to 91.4 cm and 10.4 kg.

Rainbow Trout Put-and-Take Evaluations

In Brundage Reservoir, a total of 29 tags were returned, for an estimated return-to-the-creel of put-and-take rainbow trout of 9.6 percent. Tags were returned from mid-June through mid-November.

Table 1. Summary of available midwater trawl data collected at Payette Lake in 1980, 1988, 1989, 1990, 1991, and 1992 (95% error bounds in ±% - all estimates made to 1,715 hectare useable area of lake [>40 ft depth]).

Number of Hatchery Kokanee

Year of Estimate	Number Stocked	Age 0+	Age 1+	Age 2+
1988	350,000	34,000	0	20,000
1989	350,000	18,000	0	0
1990	301,000	27,000	0	0
1991	158,000	?	?	0
1992[1]	130,530	19,774(79%)	?	?

Number of Wild/Natural Kokanee

Year of Estimate	Age 0+	Age 1+	Age 2+	Age 3+	Adult* Spawners (3+)
1980[1]	100,000	73,000	16,000	20,000	
1988	74,800(40%)	<2,000(85%)	9,000(88%)	**	26,400
1989	120,000(33%)	21,000(33%)	0	**	16,800
1990	134,000(45%)	26,000(45%)	10,000(100%)	**	19,200
1991	128,000(28%)	67,500[2]	1,187	**	20,800
1992[1]	202,240(21%)	30,887(41%)	5,015(118%)	**	37,000

Mean Wild Kokanee Density (fish/hectare)

Year of Estimate	Age 0+	Age 1+	Age 2+	Age 3+	Adult Spawners (3+)
1980[1]	50	36	8.00	10.0	
1988	43	20	5.00	NA	15.5
1989	72	22	5.00	NA	9.8
1990	78	34	3.00	11.2[3]	11.2
1991	75	39[4]	0.69	10.3(>180 mm)	12.1
1992[1]	118	18	3.00	NA	21.6

[1] Figured for 2,024 hectare, which includes the narrows section of the lake.
[2] Includes wild and stocked fish.
[3] Based on spawner escapement counts in the North Fork Payette River.
[4] Includes hatchery fish of which age is unknown.
* Peak spawner count in North Fork Payette River doubled.
**Estimates are not reliable because fish greater than 200 mm are not completely vulnerable to the trawl.

Table 2. Payette Lake trout tagging information from 1988 through 1992.

Year	New Tags	Tags caught and released	Tags caught and fish killed	Tags removed and fish released
1988	73	4	3	
1989	16	0	0	
1990	38	8	1	
1991	25	4	6	
1992	0	1	6	4
Total	152	17	16	4

Total number of tags remaining in lake beginning in 1992: 142
Total number of tags remaining in lake beginning in 1993: 132

In Horsethief Reservoir, a total of 116 tags were returned, for an estimated return-to-the-creel of put-and-take rainbow trout of 38.7 percent. Tags were reported being collected from the end of May through the early part of February 1993. This would indicate good survival of these fish in Horsethief Reservoir, even though fishing pressure there is heavy.

Hells Canyon Reservoirs

A standard survey was completed on both Hells Canyon and Oxbow reservoirs on May 4-6, 1992. The most abundant species of fish by number in both Hells Canyon and Oxbow were smallmouth bass, at 164 and 279 caught/unit effort (cpue), respectively. In biomass, the most abundant species in Hells Canyon Reservoir were carp (Cyprinus carpio), at 33.2 kg cpue (Table 3); and in Oxbow Reservoir it was smallmouth bass, at 47.72 kg cpue (Table 4).

Table 3. Percent of frequency of occurrence and relative biomass of the different species of fish collected in May 1992 in Hells Canyon Reservoir (in one unit of effort).

Species	Number Caught	Percent of Catch	Total Biomass	Percent of Total
Smallmouth bass	164	26.0	23.30	16.0
Black Crappie	149	23.0	11.80	8.0
Chiselmouth	71	11.0	23.20	16.0
Bluegill	67	11.0	0.31	0.2
Yellow Perch	66	10.0	9.70	7.0
Sucker	44	7.0	29.60	21.0
Carp	23	4.0	33.20	23.0
Squawfish	21	3.0	5.30	4.0
Channel Catfish	15	2.0	4.30	3.0
Rainbow Trout	11	2.0	1.40	1.0
Pumpkinseed	5	0.8	NA	NA
White Crappie	1	0.2	NA	NA

Note: Sculpin and Dace were also present.

In both reservoirs, black crappie (Pomoxis nigromaculatus) had the highest relative weight of all the game fish present (Figures 1 and 2) (Tables 5 and 6). Smallmouth bass and channel catfish (Ictalurus punctatus) had the poorest relative weights of all game fish present.

Fish scales collected from the standard survey were each aged. Each annuli on the scales was measured. These measurements were used to back-calculate lengths at given ages of each fish, the results of which are given in Tables 7 and 8.

Table 4. Percent of frequency of occurrence and relative biomass of the different species of fish collected in May 1992 in Oxbow Reservoir (in one unit of effort).

Species	Number Caught	Percent of Catch	Total Biomass	Percent of Total
Smallmouth bass	279	44.0	47.70	32.0
Bluegill	160	25.0	1.30	0.9
Chiselmouth	64	10.0	26.00	17.5
White Crappie	35	5.5	6.80	4.6
Black Crappie	32	5.0	5.50	3.7
Channel Catfish	32	5.0	9.00	6.0
Sucker	12	1.9	20.00	13.5
Carp	10	1.6	26.75	18.0
Squawfish	4	0.6	3.50	2.4
Rainbow trout	3	0.5	1.40	1.0
Yellow Perch	3	0.5	0.30	0.2
Pumpkinseed	0			

Note: Sculpin and Dace were also present.

The creel survey completed on Oxbow Reservoir started April 1, 1992 and ran through December 31, 1992. Due to time limitations of the creel clerk, there was a shortage of boat interviews throughout the creel. Even with this shortage, confidence limits were acceptable in most cases (less than 100%).

The total angling pressure estimate for April through December 1992 was 22,785 boat angler hours (15.1 hrs/surface acre) and 22,595 shore angler hours (15.1 hrs/surface acre). The month of May had the highest fishing pressure, with 8,410 hours on weekdays and 5,423 hours on weekend days (Table 9). November and December were the lowest angling pressure months, with no anglers being observed during the counts in either month.

The best overall harvest rates were recorded during the month of August, with 2.40 and 3.78 fish/hour for weekdays and weekends, respectively (Table 10). The best harvest rate recorded was on weekdays in June, when the average harvest rate was 3.90 fish/hour.

The month of June had the highest total harvest, with 19,484 fish, even though no boat interviews were completed in June (Table 11).

Total harvest was estimated at 67,558 fish. The total estimated number of fish caught and released was 21,122.

Smallmouth bass harvest was minimal under the new regulation. An estimated 616 smallmouth bass less than 12 inches were harvested from July 1 through December 31, 1992. Through the entire period of the creel survey, an estimated 9,983 smallmouth bass less than 12 inches and 454 smallmouth bass 12 to 16 inches were caught and released.

No smallmouth bass over 16 inches were observed during the creel survey, and none were reported caught and released.

An estimated 455 smallmouth bass in the 12 to 16-inch protected slot range were reported caught and released during the creel survey.

Of all the parties interviewed, 58 percent were Oregon Residents, 31 percent were Idaho residents, and the remaining 11 percent were from other states.

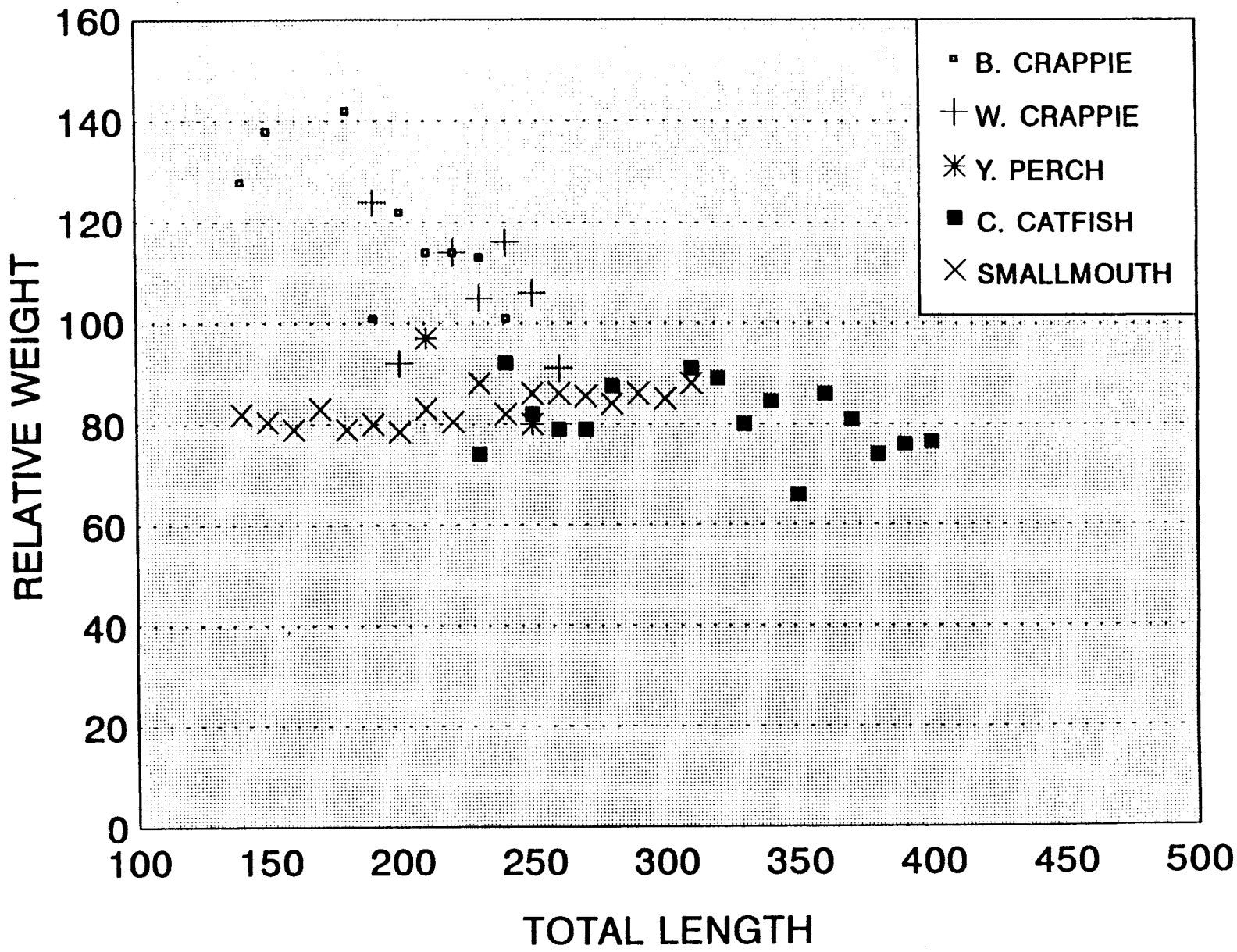

Figure 1. Relative weights (W_r) of five species of fish collected in Oxbow Reservoir in May 1992.

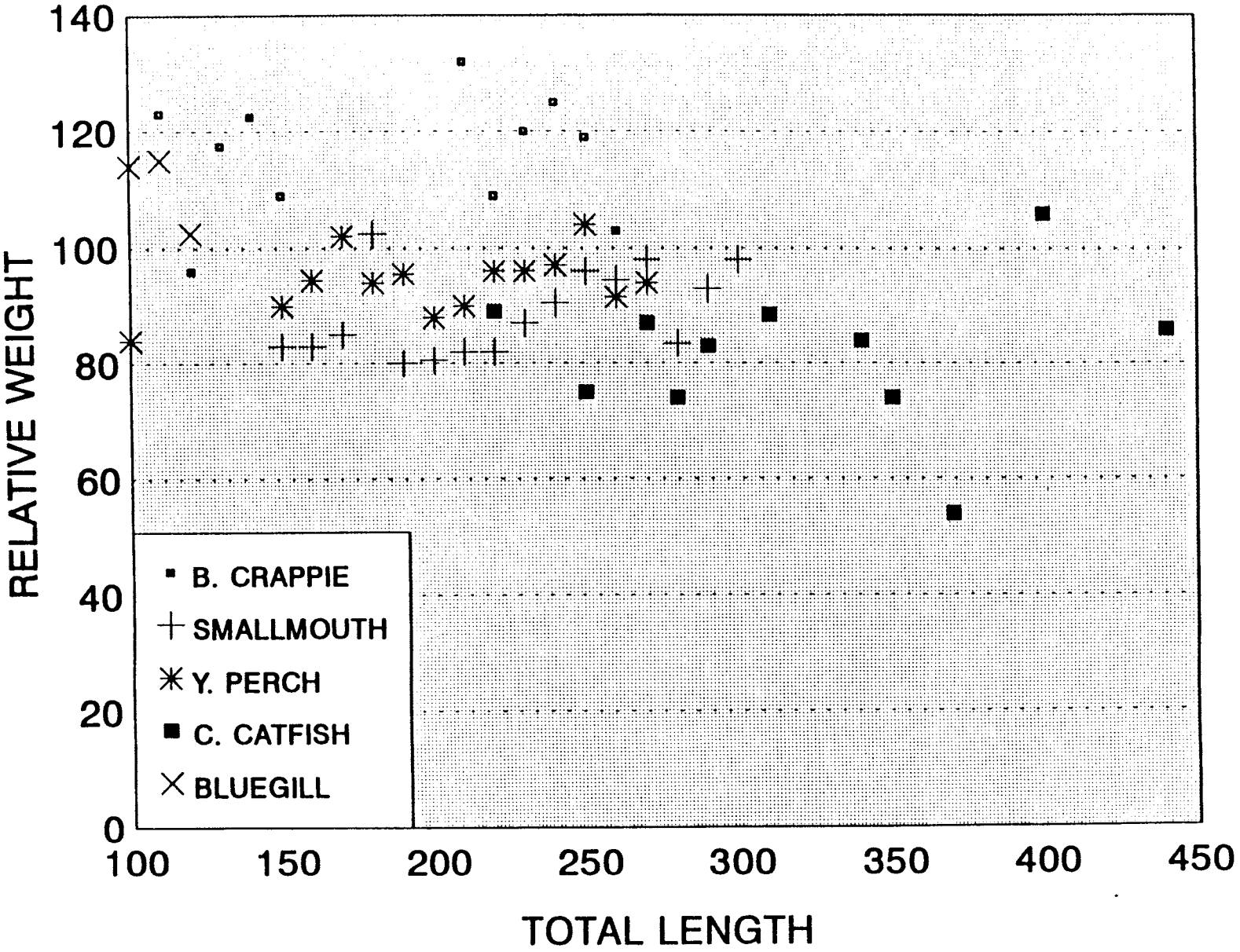

Figure 2. Relative weights (W_r) of five species of fish collected in Hells Canyon Reservoir in May 1992.

Table 5. Total number of fish collected, percentage of total, and average and relative weights of individual fish in each 10 cm length group, collected in the standard survey of Hells Canyon Reservoir in May 1992.

	Smallmouth bass				Black Crappie				Yellow Perch				Channel Catfish			
Total Length	# Col.	% of Total	Avg. Wgt.	Rel. Wgt.	# Col.	% of Total	Avg. Wgt.	Rel. Wgt.	# Col.	% of Total	Avg. Wgt.	Rel. Wgt.	# Col.	% of Total	Avg. Wgt.	Rel. Wgt.
40									10	13.7						
50	2	1.2			1	1.0			7	9.6						
60	3	1.8			2	2.2			4	5.5						
70	6	3.7			30	32.6	5.9		5	6.8						
80	2	1.2			6	6.5			3	4.1	7.0	101.0				
90	2	1.2			1	1.0			0							
100	0				0				0	0.0	10.0	84.0				
110	1	0.6			1	1.0	26.0	123.0	0							
120	4	2.4			1	1.0	24.0	96.0	0							
130	4	2.4			2	2.2	36.0	117.5	0							
140	4	2.4			2	2.2	46.0	122.5	0							
150	4	2.4	44.0	83.0	1	1.0	52.0	109.0	1	1.4						
160	10	6.1	50.0	83.0	0				1	1.4	59.0	94.5				
170	10	6.1	63.5	85.0	0				2	2.7	78.0	102.0				
180	6	3.7	80.0	102.5	0				1	1.4	80.0	94.0				
190	9	5.5	81.0	80.0	1	1.0			6	8.2	98.0	95.5				
200	14	8.5	98.0	80.5	0				3	4.1	108.0	88.0				
210	13	7.9	107.0	82.0	1	1.0	195.0	132.0	3	4.1	124.0	90.0				
220	12	7.3	133.0	82.0	4	4.4	200.0	109.0	7	9.6	155.0	96.0	1	6.25	84.0	89.0
230	18	11.0	162.0	87.0	8	8.7	250.0	120.0	6	8.2	177.0	96.0	0			
240	11	6.7	189.0	90.5	10	10.9	292.0	125.0	5	6.8	208.0	97.0	0			
250	5	3.0	219.5	96.0	12	13.0	296.0	119.0	3	4.1	259.0	104.0	2	12.50	100.0	75.0
260	8	4.9	244.0	94.5	3	3.3	320.0	103.0	4	5.5	237.0	91.0	0			
270	9	5.5	287.0	98.0					2	2.7	280.0	94.0	1	6.25	150.0	87.0
280	0		280.0	83.5									1	6.25	156.0	74.0
290	4	2.4	337.0	93.0									2	12.50	180.0	83.0
300	2	1.2	415.0	100.0									0			
310	1	0.6	435.0	98.0									2	12.50	247.0	88.5
320													1	6.25		
330													0			
340													2	12.50	310.0	84.0
350													1	6.25	295.0	74.0
360													0			
370													1	6.25	270.0	54.0
380													0			
390													0			
400													1	6.25	665.0	106.0
410													0			
420													0			
430													0			
440													1	6.25	775.0	86.0

Table 6. Total number of fish collected, percentage of total, and average and relative weights of individual fish in each 10 cm length group collected in the standard survey of Oxbow Reservoir in May 1992.

Total Length	Smallmouth bass # Col.	Smallmouth bass % of Total	Smallmouth bass Avg. Wgt.	Smallmouth bass Rel. Wgt.	Black Crappie # Col.	Black Crappie % of Total	Black Crappie Avg. Wgt.	Black Crappie Rel. Wgt.	Yellow Perch # Col.	Yellow Perch % of Total	Yellow Perch Avg. Wgt.	Yellow Perch Rel. Wgt.	White Crappie # Col.	White Crappie % of Total	White Crappie Avg. Wgt.	White Crappie Rel. Wgt.	Bluegill # Col.	Bluegill % of Total	Bluegill Avg. Wgt.	Bluegill Rel. Wgt.
30																	6	17.6	NA	NA
40																	1	3.0	NA	NA
50	5	1.8	NA														3	8.8	NA	NA
60	1	0.4	NA														8	23.5	NA	NA
70	0																7	20.5	NA	NA
80	1	0.4	NA														4	11.7	NA	NA
90	0																2	5.9	NA	NA
100	1	0.4	NA														2	5.9	NA	NA
110	1	0.4	NA														0			
120	3	1.1	NA														0			
130	0																0			
140	0		34.0	82.0	1	3.1	50	128.0	1	33	45	NA					0			
150	2	0.7	44.0	80.5	1	3.1	72	137.8	0								0			
160	4	1.4	47.0	79.0	0				0								0			
170	7	2.5	62.0	83.0	0				0								1	3.0	NA	NA
180	8	2.9	72.0	79.0	2	6.3	120	142.0	0											
190	3	1.1	78.0	80.0	1	3.1	108	101.0	0				1	2.8	120	124				
200	10	3.6	92.0	78.5	4	12.5	152	122.0	0				1	2.8	110	92				
210	15	5.4	121.0	83.0	9	28.1	168	114.0	1	33	130	97	0							
220	39	14.0	128.0	80.5	7	22.0	192	114.0	0				3	8.6	163	114				
230	52	18.6	159.0	88.0	4	12.5	224	113.0	0				14	40.0	176	105	1	3.1	82	74.0
240	49	17.6	170.0	82.0	3	9.4	230	101.0	0				6	17.1	221	116	1	3.1	108	92.0
250	34	12.2	199.0	86.0					1	33	190	80	6	17.1	231	106	1	3.1	110	82.0
260	23	8.2	226.0	86.0									2	5.7	235	91	2	6.3	120	79.0
270	10	3.6	239.5	85.5									1	2.8	NA	NA	2	6.3	136	79.0
280	7	2.5	272.0	84.0									1	2.8	NA	NA	2	6.3	170	87.5
290	3	1.1	299.0	86.0													0			
300	3	1.1	337.5	85.0													1	3.1	NA	NA
310	3	1.1	388.0	88.0													1	3.1	250	91.0
320																	1	3.1	265	88.7
330																	7	22.0	265	80.0
340																	2	6.3	307	84.5
350																	1	3.1	265	66.3
360																	2	6.3	377	86.0
370																	2	6.3	387	81.0
380																	3	9.4	388	74.0
390																	1	3.1	430	76.0
400																	1	3.1	515	84.0
410																	0			
420																	0			
430																	0			
440																	1	3.1	580	69.0

Table 7. Average back-calculated lengths for each age class of each species collected from Hells Canyon Reservoir in May 1992 (smallmouth bass data calculated by Terry Schrader, Oregon Department of Fish and Wildlife).

Year Class	Age	N	Back-Calculation Age 1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Bluegill														
1990	1	0														
1989	2	1	37	96												
1988	3	2	33	61	121											
1987	4	1	32	64	99	127										
All Classes			34	71	113	127										
N		4	4	4	3	1										
		Black Crappie														
1989	2	7	68	135												
1988	3	6	97	181	226											
1987	4	3	88	176	223	246										
1986	5	11	86	169	207	229	253									
All Classes			84	164	215	233	253									
N		27	27	27	20	14	11									
		Yellow Perch														
1990	1	4	87													
1989	2	3	69	161												
1988	3	11	79	151	202											
1987	4	13	76	154	197	224										
1986	5	11	77	146	194	220	244									
1985	6	1	83	179	211	231	251	260								
All Classes			78	152	198	222	244	260								
N		43	43	39	36	25	12	1								
		Smallmouth bass														
1990	2	2	67	155												
1989	3	7	45	120	206											
1988	4	8	38	101	158	213										
1987	5	7	45	113	165	212	243									
1986	6	7	40	107	166	207	236	258								
1985	7	7	46	125	192	227	256	278	293							
All Classes			44	115	177	215	245	268	293							
N		38	38	38	36	29	21	14	7							
		Channel Catfish														
1987	4	1	71	106	176	224										
1984	7	1	69	99	136	167	188	227	270							
1983	8	3	79	122	188	215	240	255	274	292						
1982	9	2	85	110	139	170	198	239	265	291	316					
1981	10	2	72	127	183	214	231	253	277	291	303	313				
1980	11	0														
1979	12	4	86	123	147	177	199	220	237	255	271	286	300	311		
1978	13	0														
1977	14	1	63	76	103	140	174	206	237	264	271	302	314	324	330	350
All Classes			78	115	158	189	211	235	259	277	288	296	303	313	330	350
N		14	14	14	14	14	13	13	13	12	9	7	5	5	1	1

Table 8. Average back-calculated lengths for each age class of each species collected from Oxbow Reservoir in May 1992 (smallmouth bass data calculated by Terry Schrader, Oregon Department of Fish and Wildlife).

Year Class	Age	N	Back-Calculation Age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		Yellow Perch																
1990	1	0																
1989	2	1	75	140														
1988	3	0																
1987	4	1	71	145	192	212												
All Classes			73	142	192	212												
N		2	2	2	1	1												
		Black Crappie																
1990	1	0																
1989	2	4	105	171														
1988	3	10	99	172	210													
1987	4	7	97	180	207	225												
1986	5	6	102	157	188	210	227											
All Classes			100	170	203	218	227											
N		27	27	27	23	13	6											
		White Crappie																
1990	1	0																
1989	2	1	75	182														
1988	3	3	98	203	237													
1987	4	11	87	176	210	230												
1986	5	10	95	186	214	240	253											
All Classes			91	184	215	235	253											
N		25	25	25	24	21	10											
		Smallmouth bass																
1989	3	3	46	112	164													
1988	4	1	35	84	153	190												
1987	5	7	55	135	188	227	256											
1986	6	7	58	120	177	228	257	273										
1985	7	1	51	126	219	241	271	292	303									
1984	8	1	53	123	193	242	265	282	295	306								
All Classes			53	123	181	227	258	276	299	306								
N		20	20	20	20	17	16	9	2	1								
		Channel Catfish																
1988	3	1	104	186	255													
1987	4	4	117	200	287	348												
1986	5	4	82	156	251	321	357											
1985	6	5	110	174	236	255	276	295										
1984	7	4	99	173	213	254	281	307	330									
1983	8	1	49	82	155	174	185	201	218	239								
1982	9	1	98	115	137	160	183	204	248	259	270							
1981	10	3	78	106	140	180	204	227	250	280	307	327						
1980	11	1	111	226	245	260	272	296	315	323	335	366	380					
1979	12	1	67	165	188	208	230	238	253	266	278	289	300	320				
1978	13	1	132	233	246	256	280	300	314	326	339	349	367	379	400			
1977	14	1	131	164	188	197	218	242	252	263	283	309	351	362	375	390		
1976	15	4	70	97	128	152	175	195	216	234	254	274	292	314	326	337	348	
1975	16	1	49	63	82	97	113	133	148	170	176	190	193	203	214	226	237	255
All Classes			92	151	203	236	245	247	256	255	273	292	298	306	317	316	316	255
N		32	32	32	32	31	27	23	18	14	13	12	9	8	7	6	5	1

Table 9. Total angling pressure for boat and shore anglers by month on Oxbow Reservoir, April through December 1992 (with 95% confidence intervals [+/-]).

Month	Day Type	Boat Angler Hours		Shore Angler Hours		Total Hours	
April	Weekday	99		1089		1188	
	Weekend	540		684		1224	
	Totals	639	+/- 775	1773	+/- 850	2412	+/- 1150
May	Weekday	4833		3577		8410	
	Weekend	2871		2552		5423	
	Totals	7704	+/- 5811	6129	+/- 3567	13833	+/- 6819
June	Weekday	1705		3296		5001	
	Totals	1705	+/- 1768	3296	+/- 3865	5001	+/- 4250
July	Weekday	614		2894		3508	
	Weekend	671		2349		3020	
	Totals	1285	+/- 549	5243	+/- 4615	6528	+/- 4648
August	Weekday	1418		1559		2977	
	Weekend	2520		945		3465	
	Totals	3938	+/- 2209	2504	+/- 1396	6442	+/- 2698
September	Weekday	4922		1378		6300	
	Weekend	825		863		1688	
	Totals	5747	+/- 4629	2241	+/- 1064	7988	+/- 4749
October	Weekday	1210		666		1876	
	Weekend	557		743		1299	
	Totals	1767	+/- 1214	1409	+/- 909	3175	+/- 1517
November/December		0		0		0	
Totals		22785	+/- 8125	22595	+/- 7321	45379	+/- 10937

Table 10. Summary of catch rates estimated from the creel survey on Oxbow Reservoir, April through December 1992.

Month	Day	CR Kept	CR Relsd	CR Cght	SMB <12" Kept	SMB <12" Rel	SMB 12-16" Kept	SMB 12-16" Rel	SMB >16" Kept	SMB >16" Rel	Crappie Kept	Crappie Rel	RBT Kept	RBT Rel	C. Cat. Kept	C. Cat. Rel	Y. Perch Kept	Y. Perch Rel	Bluegill Kept	Bluegill Rel
April	WD	2.46	0.31	2.77	0	0.15	0	0	0	0	2.39	0	0.0	0.08	0.08	0.08	0	0	0	0
	WE	2.07	0.07	2.15	0	0.07	0	0	0	0	1.05	0	0.44	0	0.12	0	1.46	0	0	0
May	WD	0.86	0.33	1.19	0	0.33	0	0	0	0	0.86	0	0	0	0	0	0	0	0	0
	WE	0.48	1.07	1.55	0	0.93	0	0.07	0	0	0.45	0.07	0	0	0.03	0	0	0	0	
June	WD	3.90	0.59	4.49	0	0.54	0	0.05	0	0	3.25	0	0.07	0	0.16	0	0	0	0	0
	WE	NA	NA	NA																
July	WD	1.45	0.05	1.5	0.08	0.05	0	0	0	0	1.28	0	0.02	0	0.05	0	0	0	0.03	0
	WE	1.46	0.54	2.00	0.02	0.41	0	0.02	0	0	1.29	0	0.05	0	0.10	0.11	0.01	0	0	0
August	WD	1.17	1.23	2.40	0	1.15	0	0.04	0	0	1.04	0	0	0	0.14	0.04	0	0	0	0
	WE	3.02	0.76	3.78	0	0.51	0	0.07	0	0	2.91	0	0	0	0.11	0	0	0	0	0
Sept.	WD	0.47	0.09	0.57	0	0.06	0	0	0	0	0.19	0	0	0	0.26	0.02	0.02	0.02	0	0
	WE	0.56	0.12	0.68	0.06	0.02	0	0	0	0	0.12	0	0	0	0.39	0.10	0	0	0	0
Oct.	WD	2.05	0.11	2.16	0.11	0	0	0	0	0	1.9	0.11	0	0	0.05	0	0	0	0	0
	WE	1.16	0.06	1.22	0	0.03	0	0	0	0	0.94	0	0	0	0.23	0.02	0	0	0	0
Nov.	WD	NA	NA	NA																
	WE	NA	NA	NA																
Dec.	WD	NA	NA	NA																
	WE	NA	NA	NA																
WKDY SEASON		1.24	0.27	1.51	0.02	0.23	0.00	0.01	0.0	0.0	1.09	0.01	0.01	0.01	0.07	0.01	0.0	0.0	0.0	0.0
WKND SEASON		0.88	0.26	0.11	0.01	0.20	0.0	0.02	0.0	0.0	0.68	0.01	0.05	0.0	0.10	0.02	0.15	0.0	0.0	0.0
AVG. SEASON		1.13	0.27	1.4	0.02	0.22	0.0	0.01	0.0	0.0	0.97	0.01	0.02	0.01	0.08	0.02	0.04	0.0	0.0	0.0

Table 11. Total estimated fish harvest by species in Oxbow Reservoir for April through December 1992.

Month	Day Type	Total Estimated Number Caught	Kept	Released	Total Estimated Harvest by Species: Smallmouth bass <12"	12-16"	>16"	Crappie	Rainbow Trout	Channel Catfish	Yellow Perch	Bluegill
April	Weekday	3290	366	2925	0	0	0	2833	0	91	0	0
	Weekend	2627	89	2537	0	0	0	1284	537	149	1791	0
	Total	5917	455	5462	0	0	0	4117	537	240	1791	0
	+/- 95% CI	5595	362	5370	0	0	0	4864	868	286	2759	0
May	Weekday	10008	2758	7249	0	0	0	7249	0	0	0	0
	Weekend	8416	5797	2619	0	0	0	2430	0	184	0	0
	Total	18424	8555	9868	0	0	0	9679	0	184	0	0
	+/- 95% CI	15183	9382	9863	0	0	0	9902	0	340	0	0
June	Weekday	22444	2961	19484	0	0	0	16253	360	810	0	0
	Weekend						(no creel completed on weekends in June)					
	+/- 95% CI	21607	6239	19713	0	0	0	18043	819	1423	0	0
July	Weekday	5248	161	5087	267	0	0	4497	53	161	0	109
	Weekend	6040	1619	4421	54	0	0	3899	136	302	27	0
	Total	11288	1780	9508	321	0	0	8396	189	463	27	109
	+/- 95% CI	9499	2176	8633	540	0	0	8048	322	400	62	212
August	Weekday	7157	3665	3492	0	0	0	3090	0	402	0	0
	Weekend	13105	2647	10457	0	0	0	10080	0	378	0	0
	Total	20262	6312	13949	0	0	0	13170	0	780	0	0
	+/- 95% CI	15823	8114	14008				14026	0	999	0	0
September	Weekday	3566	592	2974	0	0	0	1191	0	1663	120	0
	Weekend	1148	197	950	98	0	0	197	0	655	0	0
	Total	4714	789	3924	98	0	0	1388	0	2318	120	0
	+/- 95% CI	3902	905	3499	170			2082	0	2335	267	0
October	Weekday	4048	197	3851	197	0	0	3555	0	99	0	0
	Weekend	1585	73	1512	0	0	0	1218	0	294	0	0
	Total	5633	270	5363	197	0	0	4773	0	393	0	0
	+/- 95% CI	6377	413	5984	347	0	0	6234	0	309	0	0
November	Weekday	0										
	Weekend	0										
December	Weekday	0										
	Weekend	0										
Season Total		88682	21122	67558	616	0	0	57776	1086	5188	1938	109
	+/- 95% CI	33544	14093	28871	664	0	0	27422	1236	2988	2772	212

Lost Valley Reservoir

Of the 62 fish collected in gill nets, 39 were yellow perch, ranging in size from 105 mm to 197 mm. When the nets were pulled, yellow perch eggs were found on the nets, indicating the presence of sexually mature fish. In addition to the yellow perch, 22 brook trout and 1 bridgelip sucker (Catostomus columbianus) were collected.

Upper Payette Lake and Brundage Reservoir

Of the 317 fish collected in the nets at Upper Payette Lake, 263 were largescale suckers (Catostomus macrocheilus), 32 were rainbow trout, and 22 were brook trout. All fish collected were caught in the gill nets, except for 22 suckers caught in the trap nets.

Of the 32 rainbow trout collected, 30 were 1992 released put-and-take stocked fish. The remaining two rainbows were hatchery released fingerling, at 170 mm and 175 mm. No 1991 stocked put-and-take rainbow trout were collected.

Brook trout length frequencies are presented in Table 12.

Table 12. Length frequencies of brook trout collected in Upper Payette Lake on June 26, 1992.

Total Length	Number Collected	Average Weight (g)	Average K_{tl}
160	2	53	1.17
170	2	60	1.17
180	3	70	1.09
190	3	78	1.07
200	2	91	1.06
210	0		
220	2	143	1.30
230	1	150	1.16
240	1	160	1.09
250	1	196	1.25
260	1	205	1.17
270	1	250	1.20
280	0		
290	1	285	1.11
300	1	275	1.02
310	1	370	1.18

Splake were stocked in Upper Payette Lake in September 1992.

Of the 173 rainbow trout collected in Brundage Reservoir, 34 had an adipose clip. The size of fish collected ranged from 160 mm to 310 mm. The adipose-clipped fish ranged in size from 180 mm to 284 mm, and averaged 249 mm. These fish were approximately 114.3 mm (4.5 in) when stocked in July 1990. This equated to an annual growth rate of 67 mm (2.6 in) per year.

Fish stocked in 1991 and collected in 1992 averaged 183 mm (7.2 in). These fish were stocked at 100 mm in 1991. This equates to an annual growth rate of 81.3 mm (3.2 in) per year.

DISCUSSION

Payette Lake

An unusually large number of age 0+ fish were captured in the trawl in 1992. The 1992 age 0+ population estimate was 2.7 times larger than the largest age 0+ estimated since annual trawling began in 1988.

Of interest is the fact that age 0+ fish collected in 1988 are the parents of the 1992 age 0+ cohort. Since there are now five continuous years of trawling data, specific cohorts can be tracked to look at stock recruitment. The 1988 cohort (age 0+ in 1988), with an estimated population size of 74,800 fish, survived to produce a spawning run of around 20,800 fish. These fish spawned and produced 202,240 age 0+ fish in 1992. For each age 0+ fish present in the lake in 1988, 2.7 age 0+ fish were produced in 1992. For every spawner in 1988 (1985 cohort) an estimated 1.4 progeny survived to spawn in 1992. A problem in tracking these cohorts is the unknown percent of wild fish produced from spawning hatchery-origin fish.

There are some problems with the trawling technique in Payette Lake. It is obvious from the data collected that population estimates of fish greater than age 0+ are erroneous. The estimated population size of age 1+ kokanee in the lake has been equal to or less than the spawner population estimate for that same cohort two years later. The age 2+ estimates were extremely variable and do not reflect spawning population size the following year. No estimates were made for age 3+ fish with the trawl because they cannot be caught. Therefore, stock recruitment was not tracked using trawling population estimates for age classes 1+, 2+, and 3+.

Rainbow Trout Put-and-Take Evaluations

It is apparent that the put-and-take rainbow trout stocking program in Horsethief Reservoir is very successful. Fish return estimates were slightly below the 40 percent minimum, but again these estimates were minimum estimates. There was no attempt to determine what percentage of the tags were caught and never returned.

The Brundage Reservoir put-and-take program success is questionable. With less than 10 percent of the tags being returned, it is unlikely that 40 percent of the fish actually returned to the creel. However, we expect overall return rates to improve as more tagged fish are caught and tags returned in 1993. An evaluation in Brundage Reservoir needs to be repeated in two or three years to make sure there was no unusual loss of these fish or that for some reason tags were not returned by anglers. Brundage Reservoir would be an ideal location to evaluate the percentage of tag return rates of recovered tags. A creel census in conjunction with a tag return study would answer these questions.

Hells Canyon Reservoirs

The standard survey of Hells Canyon and Oxbow reservoirs depicts two similar, yet unique, bodies of water. Both reservoirs have similar species present, with the exception of the lack of white crappie (Pomoxis annularis) in Hells Canyon Reservoir. Fish biomass in Hells Canyon Reservoir was in approximately equal amounts, with smallmouth bass, chiselmouth (Acrocheilus alutaceus), largescale sucker, and carp making up 16, 16, 21, and 23 percent, respectively, of the total biomass collected.

In Oxbow Reservoir, fish biomass was primarily in smallmouth bass at 32 percent, while carp, chiselmouth, and largescale sucker made up 18, 17.5, and 13.5 percent, respectively.

An interesting note is the difference in crappie in the two reservoirs. In Hells Canyon Reservoir, there were four age classes of black crappie collected and only one individual white crappie collected. Growth rates were better for black crappie in Hells Canyon. In Oxbow Reservoir, both white and black crappie were collected, with four age classes being collected of both species. It is important to note that this sample probably does not represent actual abundance and biomass in these reservoirs, due to gear selectivity, fish habits, and the fact that we only sampled one time period out of the entire year.

The creel survey indicated very minimal harvest on smallmouth bass less than 12 inches. As more people become familiar with the new regulation and word gets out that the Department wants people to harvest bass less than 12 inches, the harvest rates of small bass should increase over the next two or three years. It is possible that the regulation is too restrictive and it will not attract enough pressure to change smallmouth bass growth rates. If that occurs, then a less restrictive regulation will be needed.

Lost Valley Reservoir

The treatment of Lost Valley Reservoir was only partially successful. However, a complete kill of yellow perch was not anticipated. The expected goal of three to five years of good trout survival and growth should be realized.

Upper Payette Lake and Brundage Reservoir

Upper Payette Lake has a large percentage of its biomass tied up in largescale sucker. The naturally-occurring brook trout were in excellent condition. The introduction of splake should have little effect on the trout population that exists there now. As the introduced splake get large enough to begin eating fish, young-of-the-year and yearling suckers should provide excellent forage.

The Brundage Reservoir rainbow trout population was affected by intra-specific competition. Growth rates should have been double of that which was found. Therefore, the fingerling plant scheduled for 1992 was canceled, as was the stocking scheduled for 1993. The fishery should be evaluated again in 1993. Once the population of small mature rainbow trout has been removed, fingerling stockings should be continued, but at a much reduced rate.

RECOMMENDATIONS

1. Continue to monitor kokanee densities and biomass in Payette Lake.
2. Continue to mark all hatchery origin kokanee stocked in Payette Lake. Gill net Payette Lake in 1993 to track the fate of hatchery fish.
3. Monitor kokanee recruitment to Payette Lake. (Graduate student project.)
4. Continue volunteer tagging of lake trout.
5. Repeat the evaluations of percent return of put-and-take stockings on Brundage Reservoir within the next three years. This should be done in conjunction with a creel census to evaluate what percentage of reward tags are returned.
6. Tag more lake trout in Payette Lake with reward tags to continue monitoring exploitation.
7. Repeat Oxbow Reservoir creel survey in three to four years to monitor effects of regulation change.

LITERATURE CITED

Bowles, E.C., V.L. Ellis, C. Hatch, and D. Irving. 1986. Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho. Annual Progress Report FY 1985. Agreement No. DE-A179-85BP22493. Project No. 85-339.

Bowles, E.C., V.L. Ellis, C. Hatch, and D. Irving. 1987. Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho. Annual Progress Report FY 1986. Agreement No. DE-A179-85BP22493. Project No. 85-339.

Grunder, S.A., J.D. Linman, and D.R. Anderson. 1990a. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-13. Idaho Department of Fish and Game, Boise.

Grunder, S.A., J.D. Linman, and D.R. Anderson. 1990b. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-14. Idaho Department of Fish and Game, Boise.

Janssen, P.J. and D.R. Anderson. 1992. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-15. Idaho Department of Fish and Game, Boise.

Janssen, P.J. and D.R. Anderson. 1994. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-16. Idaho Department of Fish and Game, Boise.

Van Vooren, A.R. 1992. Lowland Lakes Standard Survey. April 8, 1992, Intradepartmental Memorandum. Idaho Department of Fish and Game, Boise.

JOB PERFORMANCE REPORT

State of: Idaho Name: Regional Fishery Management Investigations

Project: F-71-R-17 Title: Region 3 (McCall) Lowland Lakes and Reservoirs Investigations - Cascade Reservoir Creel Census; Final Results

Job No.: 3(Mc)-b[2]

Period Covered: July 1, 1992 to June 30, 1993

ABSTRACT

Cascade Reservoir is a very important fishery to the State of Idaho. Typically more than 390,000 angling hours (34 hrs/hectare) are spent annually on this reservoir of 28,300 surface acres. The primary fish species sought by anglers are yellow perch (Perca flavescens), rainbow trout (Oncorhynchus mykiss and landlocked coho salmon (Oncorhynchus klsutch). To monitor this fishery, angling pressure and fish harvest estimate studies have been completed approximately every five years since 1975. In November 1990, another comprehensive creel census study was begun.

Up to 800,000 rainbow trout are stocked in Cascade Reservoir annually. This requires a significant monetary commitment from Idaho Department of Fish and Game trout hatcheries. Therefore, it is very important that the most cost-efficient fish be stocked in the reservoir. In 1990, a study was begun to determine what size and strain of fish would return-to-the-creel best in terms of numbers and weight. All rainbow trout stocked in Cascade Reservoir were marked with either a fin clip, jaw clip, or fluorescent dye. Return-to-the-creel and survival of these fish was monitored by creel census and gill netting.

Janssen and Anderson (1994) reported on the first year's results of this study. This report focused on pressure, harvest, and harvest rates from 1992 and the combined return rates of different fish stockings from both 1991 and 1992.

From December 1991 through November 1992, an estimated 295,493 angler hours (25.8 hrs/hectare) were spent on Cascade Reservoir. Monthly angler hour estimates ranged from 8,720 in November to 55,166 in May. Shore anglers accounted for 177,291 hours (60%) of the total angling effort, boat anglers 56,426 hours (19%), and ice fishing the remaining 61,776 hours (21%) (December 1, 1991 through February 28, 1992).

An estimated 267,629 fish were caught during the time covered by the creel census. Monthly harvest estimates ranged from 3,691 fish in November to 42,406 in August. Shore anglers caught an estimated 142,430 fish (53%), boat anglers, 33,090 (12%), and ice anglers 92,109 (35%).

Of all fish species caught, yellow perch made up the largest percentage of the overall harvest at 68.4 percent or 183,152 fish. Rainbow trout were the next most important at 16.2 percent or 43,396 fish. Bullhead (Ameiurus sp.) were the third most important at 5.5 percent of the total harvest or 14,850 fish.

The average harvest rate during the creel survey was 0.91 fish/hour. Ice anglers enjoyed the best harvest rate at 1.49 fish/hour. Shore and boat anglers had success rates of 0.80 and 0.58, respectively.

By number, the cost of each rainbow trout fingerling planted in 1990 (at $1.80/in each - personal communication, Tom Frew, Hagerman State Fish Hatchery, Idaho Department of Fish and Game) that returned to the creel was: Skanes/Kamloops = $16.90; Tasmanian = $13.44; and Eagle Lake = $24.50. The cost of each 10-inch spring 1991 rainbow trout that returned was $.79.

Authors:

Paul J. Janssen
Regional Fishery Biologist

Donald R. Anderson
Regional Fishery Manager

OBJECTIVES

1. To determine changes in angling pressure, success, and fish harvest since the last creel census completed in 1986.

2. To determine which size of stocked rainbow trout (Oncorhynchus mykiss) is most cost-effective in return-to-the-creel by number and pounds.

INTRODUCTION

Cascade Reservoir is a very important fishery to the State of Idaho. Typically more than 390,000 angling hours are spent annually on this reservoir of 28,300 surface acres. The primary fish species sought by anglers are yellow perch (Perca flavescens), rainbow trout, and landlocked coho salmon (Oncorhynchus kisutch). Angling pressure and fish harvest have been monitored approximately every five years since 1975. In November 1990, another comprehensive creel census study was begun.

Cascade Reservoir stocking requires a significant monetary commitment from the Idaho Department of Fish and Game (Department) fish hatcheries. Table 1 illustrates the annual fish stocking strategy for the reservoir. Similar annual stockings have taken place for the last several years. The annual dollar cost to the Department is $80,000 to $100,000. Therefore, it is imperative that the most cost-efficient stocking program be implemented on Cascade Reservoir. In 1990, a study was begun to determine which size of rainbow trout stocked in the reservoir would return to the angler best in numbers and pounds. This study ran through November 1992. Results of the first year of the study were reported by Janssen and Anderson (1994).

Table 1. Trout and salmon stocking and associated stock markings for Cascade Reservoir in 1990, 1991, and 1992.

Year	Mark	Strain	Number	Date	Size
1990	L. Ventricle	Kamloops	169,000	5/90	6.5" - 10.0/lb
	R. Ventricle	Tasmanian	145,000	5/90	7.0" - 4.7/lb
	Adipose	Eagle Lake	130,000	10/90	3-8" - 21.5/lb
	No Mark	Hayspur[1]	265,000	6/90	6.0" - 10.4/lb
	No Mark	Coho	551,500[2]	6/90	4.0" - 27.6/lb
			1,260,500		
1991	R. Maxillary	Kam./Steelhead	150,000	6/91	10.0" - 2.8/lb
	No Mark	Hayspur[1]	100,000	5/91	4.5" - 30.0/lb
	Red Dye	Kamloops	139,500	10/91	6.0" - 15.0/lb
	Orange Dye	Kamloops	145,600	10/91	6.5" - 10.4/lb
	Green Dye	Kamloops	111,220	10/91	7.0" - 8.3/lb
	No Mark	Eagle Lake	273,350	10/91	6.25" - 12.4/lb
	No Mark	Coho[3]	126,750	4/91	6.5" - 7.5/lb
			1,046,420		
1992	No Mark	Coho	579,200	5/92	5.0" - 48.0/lb
	L. Maxillary	Kam./Steelhead	115,800	5/92	10.0" - 3.0/lb 31% clipped
	R. Maxillary	Kamloops	69,500	10/92	8.0" - 3.5/lb
	Adipose	Hayspur	75,850	10/92	8.0" - 3.5/lb
			840,350		

[1] Hayspur rainbow trout were stocked as excess fish and were not marked, other than the typical fin deformities that occur in hatcheries. These fish were not kept separate from wild fish in 1990-1991, but will be in 1992.

[2] 55,000 of these were stocked in Lake Fork Creek to try and establish a spawning run for an egg source.

[3] These fish were privately raised and were in very poor condition when stocked. Only an estimated 20 percent were considered viable.

METHODS

All rainbow trout stocked in Cascade Reservoir since May 1990, with the exception of the Hayspur strain, were marked with either a fin clip, a maxillary clip, or with fluorescent pigment. The Hayspur fish were the only stocked fish present without an actual mark. However, 98 percent of these fish exhibited the typical dorsal fin deformity that is common in hatchery fish. Therefore, these fish were identifiable by size and lack of true mark, other than the deformed dorsal. All stocked fish were monitored using primarily creel census and, to a limited degree, gill netting.

Creel Survey

A random comprehensive creel census was used to track marked rainbow trout and determine angling pressure and success. The census was started on Cascade Reservoir in November 1990 and continued through November 1992. The creel census was structured similarly to the creel completed in 1986 (Anderson et al. 1987) and is described in detail by Janssen and Anderson (1993). Any trout encountered in the creel were measured to the nearest millimeter and weighed to the nearest 5 g. Any smallmouth bass (Micropterus dolomieu) encountered were weighed and measured. Scales were also taken from smallmouth bass and later aged and growth back-calculations made.

Gill netting

In 1992 gill nets were used to collect salmonids to look at relative survival of the different stockings. On July 29, 30, and 31, 1992 three open water, midwater (horizontal nets were suspended from the water surface with floats and line) overnight gill net sets were made. At each netting site three nets were used. Each net was suspended at different depths. One net was suspended to fish the 6 to 12-foot depth below the surface. The second net fished the 12 to 18-foot depth, and the third net fished the 18 to 24 foot depth. This strategy was used to collect fish above, at, and below the thermocline.

A temperature and dissolved oxygen profile was used to find the thermocline at each netting site. This strategy allowed us to collect mainly salmonids, eliminating the large time-consuming task of removing large numbers of yellow perch, sucker (Catostomus sp.), and squawfish (Ptychocheilus oregonensis) from the nets. Nets were set and fished all night, pulled the next day, then moved to a new location. Each net was in the water an average of 19 hours (9.4 night hours).

RESULTS

Creel Survey

Monthly and total estimates of angling pressure, harvest, and harvest rates for 1986, 1991, and 1992 and totals only for 1980 are given in Table 2.

From December 1991 through November 1992, an estimated 295,493 angler hours (25.8 hrs/hectare) were spent on Cascade Reservoir. Monthly angler hour estimates ranged from 8,720 in November to 55,166 in May. Shore anglers accounted for 177,291 hours (60%) of the total angling effort, boat anglers 56,426 hours (19%), and ice fishing the remaining 61,776 hours (21%) (December 1, 1991 through February 28, 1992).

Table 2. Total estimated angler hours, harvest rates, and total harvest for Cascade Reservoir for April 1986 through May 1987, December 1990 (winter ice) through November 1991, and December 1991 through November 1992 (with 95% confidence intervals).

		Angler Hours				Harvest Rates			Total Harvest			
Month	Type	1982	1986	1991	1992	1986*	1991	1992	1982	1986[1]	1991	1992
June	Boat		30,100	5,890	11,072 ± 55%	1.50	0.460	0.80 ± 100%		51,800	2,300	9,128 ± 83%
	Shore		24,800	11,496	15,474 ± 46%	1.30	1.300	0.99 ± 81%		36,200	22,048	14,557 ± 77%
July	Boat		54,600	23,234	11,946 ± 45%	1.10	0.440	0.49 ± 128%		52,500	12,399	5,835 ± 99%
	Shore		19,500	13,904	11,506 ± 51%	2.10	0.450	1.07 ± 157%		41,300	5,610	13,057 ± 109%
August	Boat		58,900	12,114	8,660 ± 27%	2.70	0.310	0.60 ± 168%		141,300	4,577	6,555 ± 98%
	Shore		10,400	12,789	9,320 ± 32%	0.80	0.410	4.10 ± 216%		8,300	5,294	35,851 ± 168%
September	Boat		15,200	8,469	4,176 ± 43%	1.30	0.500	1.00 ± 203%		22,000	4,411	4,157 ± 159%
	Shore		7,100	16,406	27,598 ± 33%	1.00	0.270	0.65 ± 82%		7,500	4,372	21,731 ± 58%
October	Boat		9,700	2,004	1,485 ± 85%	0.60	0.360	3.75 ± 720%		5,100	716	2,846 ± 814%
	Shore		9,400	16,568	19,696 ± 32%	0.40	0.410	0.65 ± 189%		4,100	6,773	11,492 ± 150%
November	Boat		0	50	575 ± 111%	0.00	0.000	0.15 ± 33%		0	0	88 ± 109
	Shore		3,980	2,895	8,145 ± 55%	0.40	0.510	0.46 ± 86%		1,740	1,456	3,603 ± 86%
92/93	Ice		50,800	13,823	61,776 ± 70%	1.40	0.670	1.49 ± 57%		88,400	11,427	92,109 ± 84%
March	Boat				234 ± 200%			0.00			0	
	Shore				27,703 ± 142%			0.26 ± 86%				7,911 ± 133%
April	Boat		9,200	411	630 ± 49%	0.50	0.075	0.19 ± 244%		2,800	29	122 ± 242%
	Shore		35,000	18,265	20,331 ± 60%	0.90	0.160	0.45 ± 98%		37,900	2,738	9,079 ± 87%
May	Boat		35,100	3,857	17,648 ± 99%	4.00	0.120	0.28 ± 86%		54,560	333	4,359 ± 122%
	Shore		18,000	9,730	37,518 ± 84%	4.70	0.170	0.61 ± 88%		71,390	2,037	25,149 ± 89%
Total	Boat	255,674	212,800**	56,029	56,426	1.55	0.440	0.58	421,419[2]	330,060	24,765	33,090
	Shore	129,781	128,180	102,053	177,291	1.62	0.490	0.80		208,430	50,328	142,430
	Ice	28,832	50,800	13,823	61,776	1.74	0.830	1.49	38,515	88,400	11,427	92,109
Grand Total		374,492	391,780	171,905	295,493	1.60	0.480	0.91	460,419	626,890	83,765	267,629

[1] Includes only game fish, other years include all fish.

[2] Includes both boat and shore angler harvest.

* Mathematical error corrected from 1986 report.

** Recalculated from corrected 1986 report data.

An estimated 267,629 fish were caught during the time covered by the creel census in 1992-1993. Monthly harvest estimates ranged from 3,691 fish in November to 42,406 in August. Shore anglers caught an estimated 142,430 fish (53%), boat anglers 33,090 (12%), and ice anglers 92,109 (35%).

The average harvest rate from December 1991 through November 1992 was 0.91 fish/hour. Ice anglers enjoyed the best harvest rate at 1.49 fish/hour. Shore and boat anglers had success rates of 0.80 and 0.58, respectively.

Harvest rates for yellow perch peaked in August and October. Rainbow trout showed the typical spring and fall peaks in harvest rates, especially in early spring as the ice receded from the shoreline. Harvest rates for coho salmon were poor for the entire year, with the exception of the first two weeks of ice cover in December 1991. Combined monthly shore and boat harvest rates for yellow perch, rainbow trout, and coho salmon are illustrated in Figure 1. Harvest rates for these three species for boat and shore anglers are given in Table 3.

Table 3. Monthly harvest rates (fish/m) of yellow perch, coho salmon, and rainbow trout by boat and shore anglers, December 1991 through November 1992.

Month	Angler Type	Yellow Perch	Rainbow Trout	Coho
12/91-2/92	Ice	1.242	0.230	0.127
	Shore	0.000	0.695	0.000
3/92	Boat	0.000	0.000	0.000
	Shore	0.000	0.258	0.005
4/92	Boat	0.078	0.091	0.000
	Shore	0.114	0.298	0.002
5/92	Boat	0.156	0.042	0.019
	Shore	0.487	0.019	0.004
6/92	Boat	0.696	0.057	0.020
	Shore	0.647	0.048	0.000
7/92	Boat	0.271	0.111	0.004
	Shore	0.676	0.000	0.000
8/92	Boat	0.476	0.093	0.002
	Shore	3.694	0.011	0.000
9/92	Boat	0.653	0.296	0.000
	Shore	0.288	0.211	0.002
10/92	Boat	3.750	0.000	0.000
	Shore	0.372	0.249	0.000
11/92	Boat	0.000	0.150	0.000
	Shore	0.003	0.434	0.021

Of all the fish species caught, yellow perch made up the largest percentage of the overall harvest at 68.4 percent or 183,152 fish (Table 4.). Rainbow trout were the next most important at 16.2 percent or 43,396 fish. Bullhead (*Ameiurus sp.*) were the third most important at 5.5 percent of the total harvest or 14,850 fish. Figure 2 graphically displays the importance of each species of fish in the creel in overall harvest.

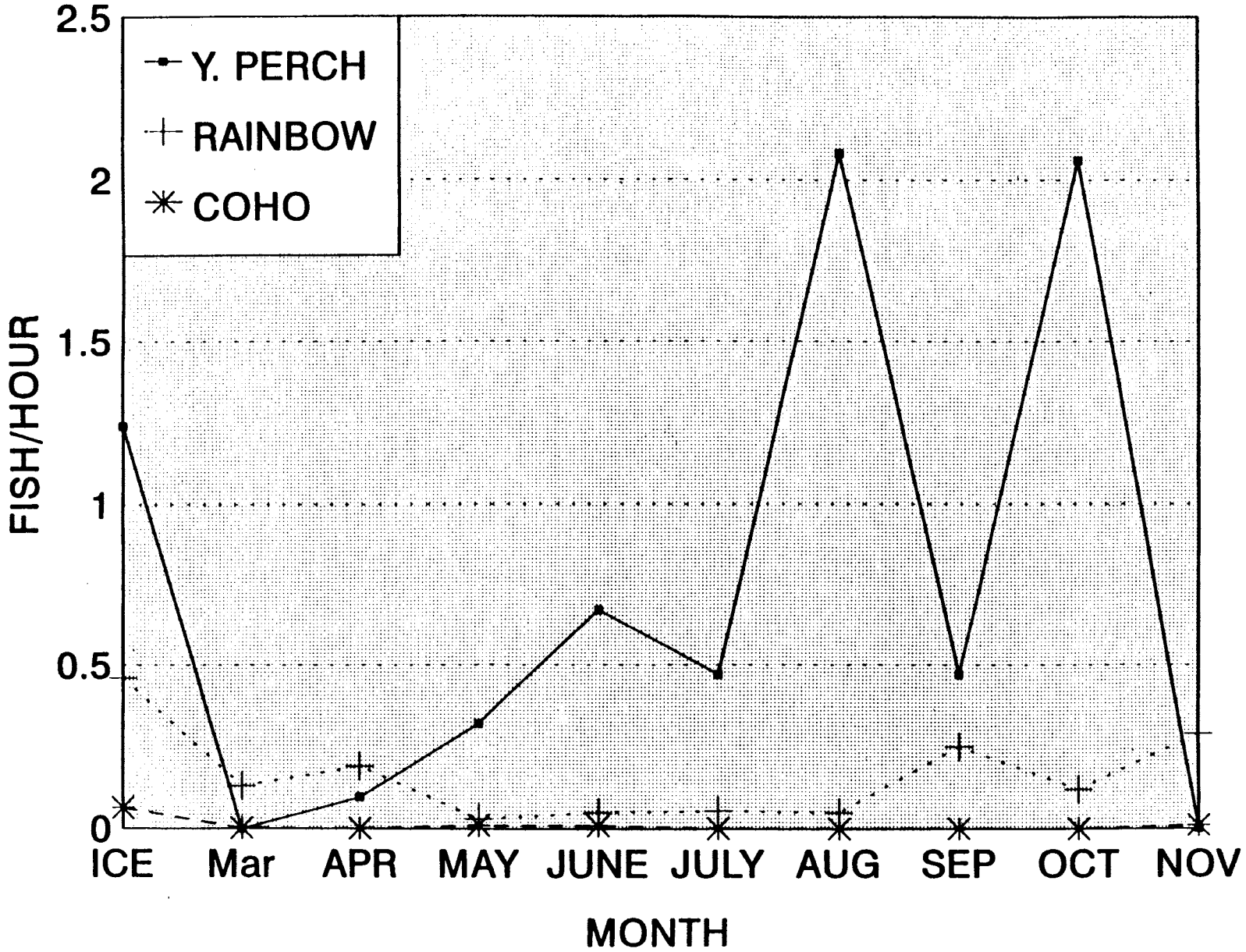

Figure 1. Combined boat and shore harvest rates for yellow perch, rainbow trout, and coho salmon in Cascade Reservoir in 1992.

Table 4. Estimated fish harvest in 1991-1992 by species and month in Cascade Reservoir.

Month	Yellow Perch	Rainbow Trout Hatchery	Rainbow Trout Wild	Brook Trout	Coho Salmon	Unseen Trout	Bullhead	Smallmouth Bass	Crappie	Squawfish	Largescale Sucker
Ice[1]	70,192	12,441	850	0	7,189	1,372	0	0	0	65	0
3/92	0	7,588	76	0	152	532	0	0	0	0	0
4/92	2,353	5,400	632	45	45	33	0	16	0	226	452
5/92	21,576	717	0	0	444	680	1,256	0	0	4,835	0
6/92	17,490	469	78	0	236	817	3,514	125	0	955	0
7/92	11,437	834	263	0	44	644	4,161	588	0	921	0
8/92	37,644	700	170	0	24	243	2,140	536	0	951	0
9/92	12,804	7,920	170	0	81	495	3,745	162	97	390	0
10/92	9,633	4,229	34	0	0	273	34	0	0	68	0
11/92	23	3,098	140	0	164	240	0	0	0	0	0
TOTAL	183,152	43,396	2,413	45	8,379	5,329	14,850	1,427	97	8,411	452
%	68.4	16.2	0.9	.02	3.1	2.0	5.5	.5	.04	3.1	.2

[1] 12/1/91 - 2/29/92

Table 5. Cascade Reservoir marked stocked rainbow trout percentage of return results as of November 31, 1992.

STRAIN	MARK	# STOCKED	MO/YR STOCKED	SIZE (IN)	NUMBER/ POUND	MONTHS IN RES	1991 EST HARVEST	1992 EST HARVEST	% TOTAL RTN (#)	% TOTAL RTN (WGT)	AVE MO % RTN (#)	AVE LTH 11/92 (mm)	AVE WGT 11/92 (g)	COST/FISH RETURNED
SKA/KAM	L VENT	169,000	9/90	6.5	10.0	26	185	985	0.69	8.8	.026	468	1,117	$17.00
TAS	R VENT	145,000	5/90	7.0	4.7	30	965	394	0.94	10.1	.030	578	1,972	13.50
EAGLE	ADIPOSE	135,450	10/90	4.5	21.5	25	160	269	0.32	6.7	.013	487	915	24.50
KAM/SHD	R MAX	150,000	6/91	10.0	2.8	17	9,698	24,459	22.80	47.8	1.340	445	811	0.79
KAM	GREEN DYE	111,220	10/91	7.0	8.3	14	58	0	0.05	0.0	.004	NA	NA	243.00
KAM	RED DYE	139,500	10/91	6.0	15.0	14	0	0	0.00	0.0	.000	NA	NA	******
KAM	ORNG DYE	145,600	10/91	6.5	10.4	14	0	24	0.02	0.0	.001	NA	NA	710.00
KAM/SHD	L MAX	115,800	6/92	10.0	3.0	6	NA	13,677	11.80	23.6	1.970	351	446	<1.52[1]
HAYSPUR	ADIPOSE	75,850	10/92	8.0	3.5	2	NA	650	0.86	NA	0.430	242.5	110	NA
KAM	R MAX	69,500	10/92	8.0	3.5	2	NA	670	0.96	NA	0.480	NA	NA	NA

[1] Does not include 1993 returns, when we expect equal or higher numbers of return.

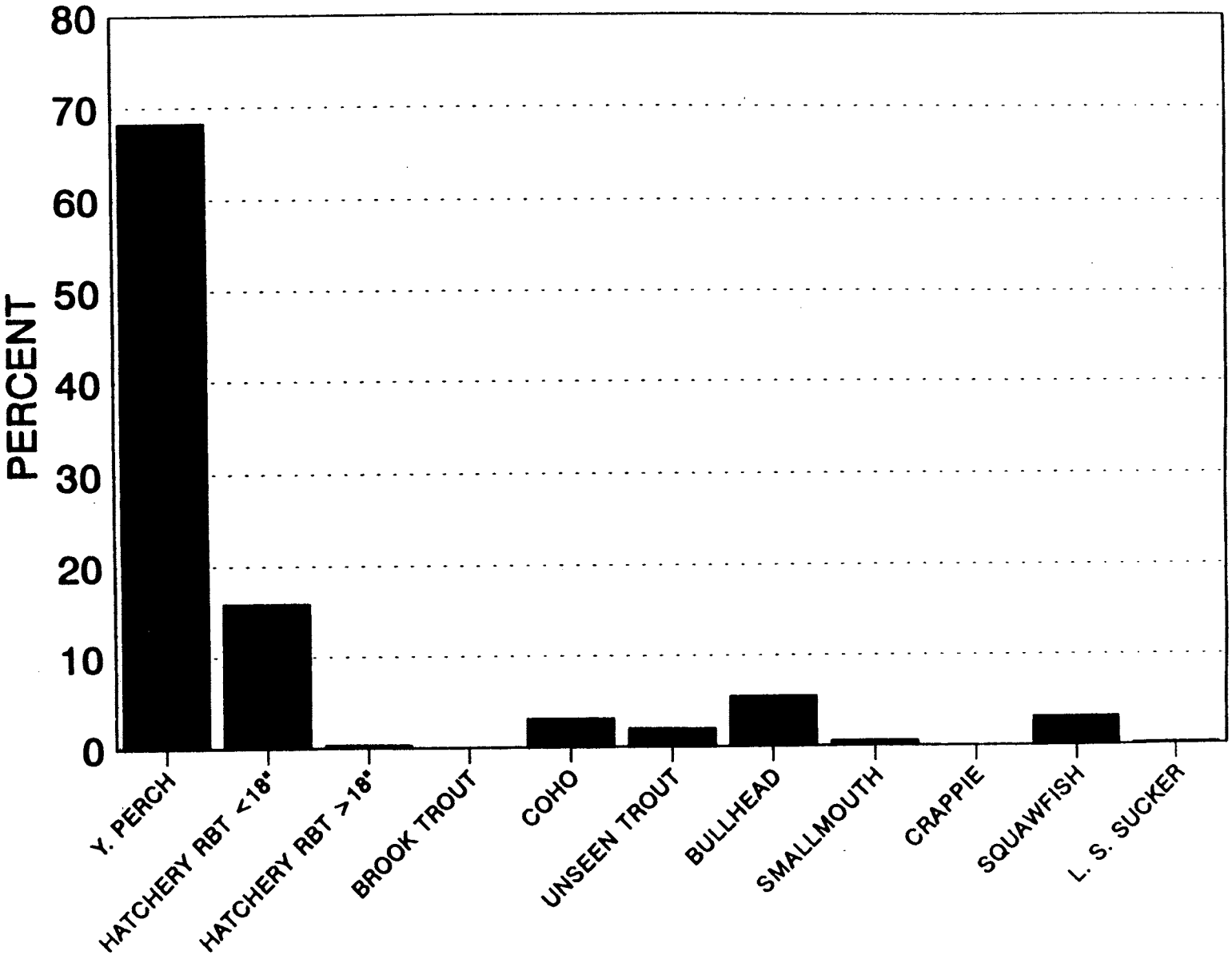

Figure 2. Percent of incidence of each fish species in the creel in Cascade Reservoir in 1992.

Return-to-the-creel of marked stocked rainbow trout during the two-year evaluation period ranged from 0 to 22.8 percent (Table 5.). The lowest returns were from the fall 6-inch Kamloops fingerling stocking. These had been in the system for 13 months with a 0 percent return. To date, the best return had been the stocking of 10-inch Kamloops/steelhead both in 1991 and 1992. The fish stocked in 1991 had been in the system for 17 months, as of November 30, 1992, with a 22.8 percent return by number and 47.8 percent return by weight.

Figure 3 illustrates the relationship between the size of rainbow trout at stocking (number/pound) and the following percentage of return-to-the-creel. Growth rates and condition factors of spring stocked 10-inch Kamloops/steelhead are depicted in Figure 4.

The Kamloops/steelhead group (right maxillary-clipped) stocked in the spring of 1991 grew an average of 14.2 mm per month for the first six months. For the total 17 months in the reservoir, they grew an average of 11.4 mm per month. The Kamloops/steelhead group, stocked in the spring of 1992 (left maxillary), grew an average of 15.8 mm per month their first six months in the reservoir.

A total of 22 smallmouth bass were weighed and measured in 1992. Growth of smallmouth bass in Cascade Reservoir was found to be excellent. Age 3+ bass averaged 5 mm, and at age 4+ averaged 330 mm (Table 6). The largest bass measured was 390 mm and 870 g, and was aged at 5+.

Table 6. Average back-calculated lengths (mm) for each age class of smallmouth bass measured at Cascade Reservoir in 1992.

			Back-Calculated Age				
Year Class	Age	N	1	2	3	4	5
1991	1	0					
1990	2	0					
1989	3	10	93	155	195		
1988	4	5	87	180	281	325	
1987	5	7	87	176	259	334	363
All Classes			90	167	235	330	363
N		22	22	22	22	12	7

Gill netting

A total of 175 net hours (79 night hours) were spent to collect a total of 66 salmonids. Of these, 74 percent (49) were coho salmon, 12 percent (8) unmarked hatchery rainbow trout, 9 percent (6) left maxillary-clipped rainbow trout, and the remaining 5 percent (3) were wild rainbow trout.

Of the eight unmarked hatchery rainbow trout collected, all were of a size equal to the left maxillary-clipped fish collected. They were also accounted for by the percent of this stocking that was marked (31%) (6/.31=19).

The coho salmon collected represented three age classes. The length frequencies of these fish are illustrated in Figure 5.

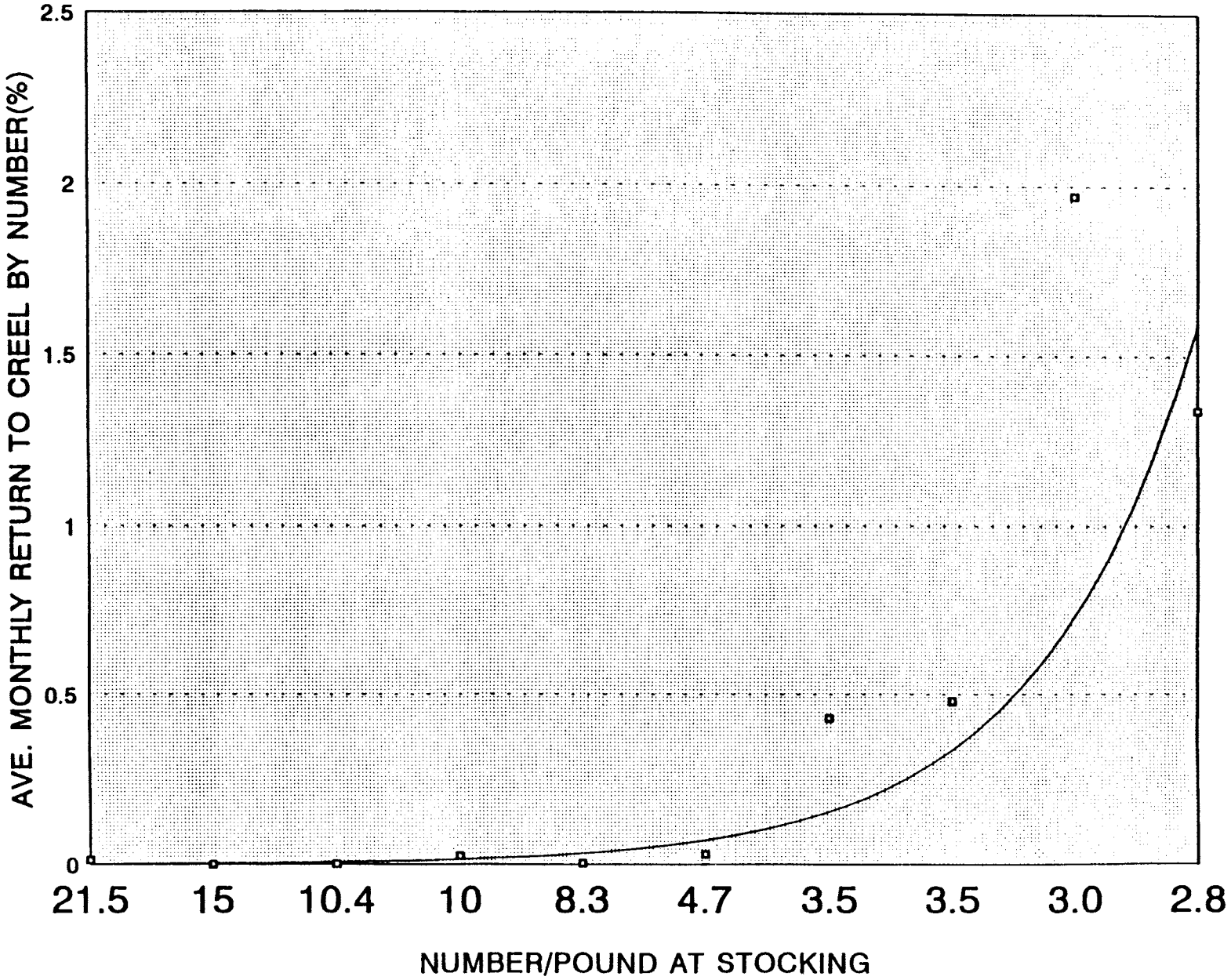

Figure 3. Percent of rainbow trout returning to the creel versus size of fish at stocking in Cascade Reservoir in 1992.

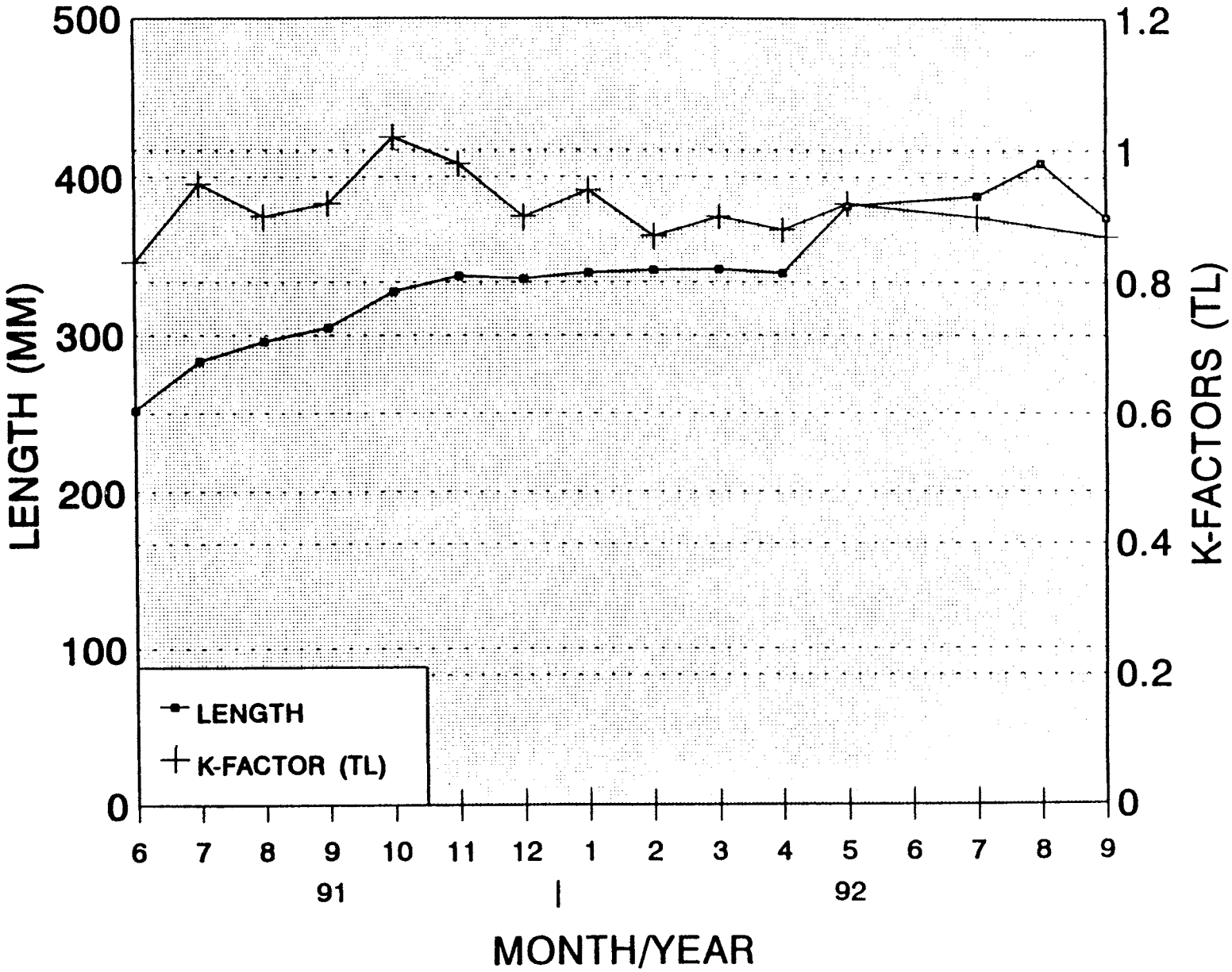

Figure 4. Condition factors and growth rates of Kamloops/steelhead strain rainbow trout in Cascade Reservoir during 1991 and 1992.

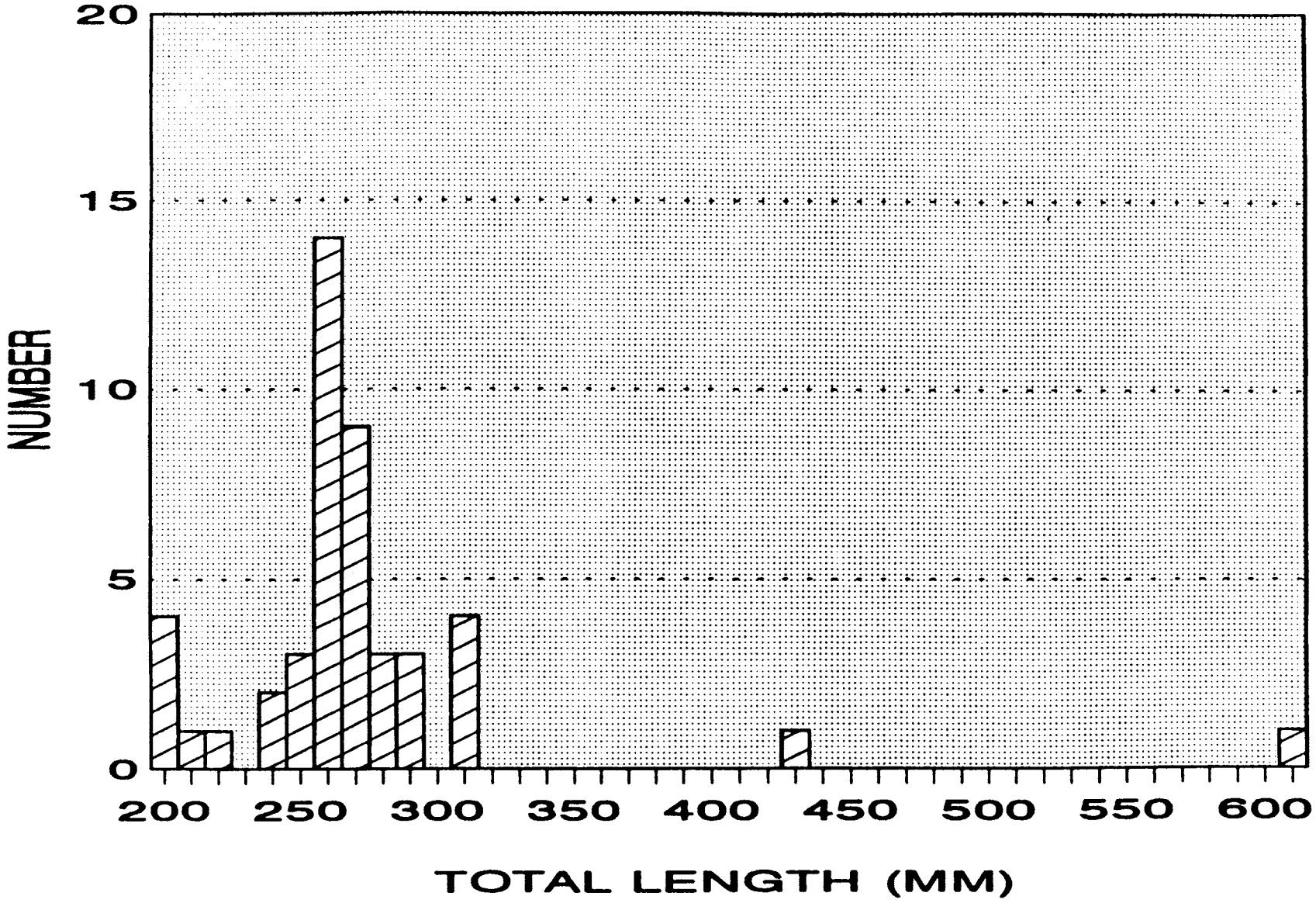

Figure 5. Length frequencies of coho salmon caught with gill nets on July 30, 1992 on Cascade Reservoir.

DISCUSSION

There was an increase in fishing pressure in 1992 over that estimated in 1991. This was largely attributed to improved yellow perch catch rates. Total fishing pressure remained below levels recorded for both 1982 (374,492 hours open water and 39,796 hours ice fishing) (Reininger et al., 1983) and 1986. Total fishing pressure is expected to increase during the next two to three years. This is due to a large number of yellow perch that, by the summer of 1993, will be abundant enough and large enough for most people to catch and harvest.

There was an obvious trend between the size of rainbow trout stocked and the following year's fishing success. However, the ability to determine which size of fish stocked will provide the greatest return has been greatly diminished, due to the use of several different strains of fish in this study. The difference in strain performances in given situations is well documented. From this study, it is virtually impossible to tell what size a certain strain of fish needs to be to provide a fishery in Cascade Reservoir.

Results of this two-year study show that the stocking of 10-inch rainbow trout in the spring was far more efficient than were the 5 to 8-inch spring or fall stockings. To date, the 10-inch fish returned to the creel 33 times better by number and 5.4 times better by weight than the most successful fingerling plant (fall, 6.5-in Kamloops strain).

By number, the cost of each fingerling planted in 1990 (at $1.80/in each) that returned to the creel was: Skanes/Kamloops = $16.90; Tasmanian = $13.44; and Eagle Lake = $24.50. The cost of each 10-inch spring 1991 rainbow trout that returned was $.79.

The 6 to 7-inch fingerling planted in the fall of 1991 performed very poorly. None of the 140,000 6-inch fish returned to the creel. Only an estimated 28 of the 146,000 6.5-inch fingerling returned to the creel (for a cost/fish returned of $710). Of the 111,000 7-inch fingerling planted, an estimated 58 returned to the creel (for a cost/fish returned of $243).

It is important to note that there were significant changes in stock survival between 7 and 8 inches and between 8 and 10 inches. Data from this study indicate that 8-inch fish are right on the borderline of size versus survival in Cascade Reservoir. Therefore the recommendation was to avoid stocking anything less than a 9-inch fish. This would insure the survival of any rainbow trout stocking. It is not worth the gamble to stock smaller fish when a 9-inch fish will guarantee good survival.

Yellow perch fishing should be excellent for 8 to 9-inch fish, beginning in the summer of 1993, when two very strong year classes reach that size.

RECOMMENDATIONS

1. Plant 300,000 9 to 10-inch rainbow trout and 500,000 4 to 5-inch coho salmon annually.
2. Continue to monitor returns of marked rainbow trout catchables.
3. Determine what reservoir volume is needed to maintain coldwater fish species during summer stratification.
4. Repeat a creel census in Cascade in approximately five years.
5. Monitor smallmouth bass and crappie (Pomoxis sp.) populations.

LITERATURE CITED

Anderson, D.R., D. Scully, J. Hall-Griswold, and B. Arnsberg. 1987. Federal Aid in Fish Restoration. Regional Fisheries Management Investigations. Job Performance Report. Project F-71-R-11. Idaho Department of Fish and Game, Boise.

Janssen, P.J. and D.A. Anderson. 1994. Federal Aid in Fish Restoration. Regional Fisheries Management Investigations. Job Performance Report. Project F-71-R-16. Idaho Department of Fish and Game, Boise.

Reininger, B., B. Reiman, N. Horner. 1983. Federal Aid in Fish Restoration. Job Performance Report. Project F-73-R-5. Idaho Department of Fish and Game, Boise.

JOB PERFORMANCE REPORT

State of: Idaho Name: Regional Fishery Management Investigations

Project: F-71-R-17 Title: Region 3 (McCall) Rivers and Streams Investigations

Job No.: 3 (Mc)-c

Period Covered: July 1, 1992 to June 30,1993

ABSTRACT

North Fork Payette River above Payette Lake

The spawning run of kokanee (Oncorhynchus nerka kennerlyi) in the North Fork Payette River from Payette Lake has been monitored since 1988 to assess spawning escapement and to serve as a method of validating kokanee population/density estimates and survival estimates from trawling.

In 1992, a graduate research project was started to determine spawning success of kokanee in the North Fork Payette River. An adult kokanee spawner trap was operated as part of a University of Idaho (University) research project. Aspects of that research will be reported on by the University. This report deals with the Idaho Department of Fish and Game's involvement in the study of kokanee in the North Fork Payette River.

The entire spawning run in the North Fork Payette River was visually counted on five separate occasions. All live and dead fish were counted separately. The kokanee spawning run was first counted on August 24, 1992 with an estimated 3,000 live kokanee being present above the trap. The first count of the entire stream both above and below the trap was made on September 1, 1992, with 1,742 live fish below the trap and 10,080 live fish present above the trap. The counts peaked on September 8, 1992 with a count of 18,451 live fish and 90 dead fish in the entire length of stream.

The total run estimate by the stream count method (doubling the largest daily live and dead spawner count) above and below the trap was around 37,000 fish. Using the 12 percent correction factor figured from last year's run, the 1992 run estimate was 32,560 fish. The shoreline count was to be calibrated again in 1992 by University trap counts; however, the trap was not fish-proof and several thousand kokanee got through the trap uncounted.

Big Creek

Big Creek cutthroat trout (Oncorhynchus clarki)were sampled with hook and line gear by two volunteers on June 10, 1992. Fish caught were measured to the nearest inch and released. A total of 151 fish were caught. Of the total number, 92 percent were cutthroat trout, 6 percent were bull trout (Salvelinus confluentus), 1.5 percent were mountain whitefish (Prosopium williamsoni), and 0.5 percent were rainbow trout (Oncorhynchus mykiss). The cutthroat trout caught ranged in length from 8 to 18 inches. The bull trout ranged from 14 to 21 inches. The one rainbow trout was 9 inches. The two mountain whitefish were 12 and 14 inches. No hours of effort were recorded.

North Fork Payette River below Payette Lake

A total of 3,486 rainbow trout fingerling (at 8.3/lb) were stocked in the North Fork Payette River just below the Payette Lake dam on May 7, 1992. The North Fork Payette River was then snorkeled on June 17, from the Payette Lake Dam to the fish hatchery, and on June 20, from the McCall sewage treatment pond effluent downstream to Sheep Bridge (directly east of the U.S. Forest Service smoke jumper base) to look for survival of this stocking. Fish of all species were counted by size groups as they were encountered.

Very few rainbow trout were encountered in either section snorkeled. In the furthest upstream section, no rainbow trout fingerling were encountered. In the further downstream section, there were two possible rainbow trout fingerlings observed.

Authors:

Paul J. Janssen
Regional Fishery Biologist

Donald R. Anderson
Regional Fishery Manager

OBJECTIVES

To maintain information for fishery management activities and decisions for rivers and streams.

INTRODUCTION

North Fork Payette River above Payette Lake

The North Fork Payette River above Payette Lake provides the only suitable spawning area for kokanee (Oncorhynchus nerka kennerlyi) in the lake system, and this reach extends only as far as Fisher Creek (Grunder et al. 1990). The spawning run of kokanee has been monitored since 1988 to assess spawning escapement and to serve as a method of validating kokanee population/density estimates and survival estimates from trawling.

Big Creek

Big Creek, a tributary to the Middle Fork Salmon River, was made a catch-and-release fishery in 1982. Previous to and since that time, the creek has been sampled several times to monitor wild trout populations. A description of the Big Creek fishery and the changes in it due to regulation changes was given by Grunder et al. (1990). In 1992, a limited amount of data was collected on Big Creek and is presented in this report.

North Fork Payette River below Payette Lake

Rainbow trout (Oncorhynchus mykiss) fingerling were experimentally stocked in the North Fork Payette River to find out how well they would survive and grow in this section of river. The fish were released just below the Payette Lake Dam in May 1992. A similar attempt was made in 1987 with brown trout (Salmo trutta) as was reported by Scully and Anderson (1989).

METHODS

North Fork Payette River above Payette Lake

All spawning kokanee were visually counted on five different dates throughout the spawning run. Counts were made by walking the stream and visually counting individual fish, keeping separate counts for live and dead fish. Totals were kept separately for above and below the University of Idaho kokanee weir. All live and dead fish were counted separately. A total spawning run estimate was then made by doubling the largest daily live and dead spawner count.

Otoliths were taken from a small sample of dead fish to verify that age structure of the run had not changed from previous years.

Big Creek

Big Creek cutthroat trout (Oncorhynchus clarki) were sampled with hook and line gear by two volunteers on June 10, 1992. Fish caught were measured to the nearest inch and released.

North Fork Payette River below Payette Lake

In June, two sections of the North Fork Payette River were snorkeled. Three people, adjacent to each other, floated downstream recording species of all fish observed. A visual estimate of length was also make of each fish encountered.

The first section started at the cement plant, approximately 1/8-mile below the Payette Lake Dam, and went down to the downstream property border of the River Bend condominiums. In total, this section was aprroximately 1/8-mile long. The second section was approximately 3/4-mile long and went from 100 yards above the McCall sewage ponds effluent downstream to Sheep Bridge (directly below the new U.S. Forest Service smoke jumper base).

RESULTS

North Fork Payette River above Payette Lake

The kokanee spawning run began approximately August 17, 1991 and ran through mid-October. Fish actually moved through the weir from August 24 through September 30, 1991. The spawning fish count totals, obtained by walking the stream, are given in Table 1. The peak count came on September 8, 1992 when 18,500 fish were counted in the entire river.

Table 1. Shoreline counts of spawning kokanee above and below the weir trap in the North Fork Payette River above Payette Lake in August 1992.

	Above Weir		Below Weir				
Date	Live	Dead	Live	Dead	Total	Run Estimate	kg/Hectare
8/20/92					3,000		
9/01/92	10,080	0	1,742	0	11,822		
9/08/92	16,945	88	1,506	2	18,541	37,000	8.1
9/14/92	11,466	1,551	2,310	24	15,351	32,560 adjusted*	
9/21/92	5,657	1,700	1,380	35	8,772		

*(37,000 x .88 = 32,560)

The peak count of 18,541 fish came on September 8, 1992. The total spawner estimate for 1992 by the shoreline count method was 37,000 fish (greatest shoreline count doubled). If we use the 12 percent correction factor (shoreline count estimate of total run size was 12 percent higher than total trap count) calculated last year, the total run estimate would be 32,560. This equates to a density of age 3+ kokanee in Payette Lake (1,715 hectare) of 19 fish/hectare.

The average fork length of male spawners was 298 mm, compared with 320 mm for females. The average weight of females was 360 g (no weights were recorded for males).

Weights from last year's spawning males were used to estimate this year's spawning male kokanee biomass, estimated to be approximately 395 g/fish and 6,431 kg total. Using 360 g for females and 395 g for males as average weights and assuming a 50:50 ratio, the total biomass estimate for Payette Lake for adult spawning fish was approximately 13,967 kg or 8.1 kg/hectare for the entire lake (1,715 hectare).

The average age of spawning kokanee was 3+, the same as last year.

Big Creek

A total of 151 fish were collected. Of the total number, 92 percent were cutthroat trout, 6 percent were bull trout (Salvelinus confluentus), 1.5 percent were mountain whitefish (Prosopium williamsoni), and 0.5 percent were rainbow trout. The cutthroat trout caught ranged in length from 8 to 18 inches. The bull trout ranged from 14 to 21 inches. The one rainbow trout was 9 inches. The two mountain whitefish were 12 and 14 inches. Many age classes of cutthroat trout were represented in the sample (Figure 1). No hours of effort were recorded.

North Fork Payette River below Payette Lake

Very few rainbow trout were encountered in either section snorkeled (Table 2). In the furthest upstream section, no rainbow trout fingerling were encountered. In the furtherest downstream section, there were two possible rainbow trout fingerlings observed.

Table 2. Species, numbers, and size of fish encountered while snorkeling two sections of the North Fork Payette River in June 1992.

Species	Size	Number	
Upper Section: Payette Lake Dam to just above the McCall Fish Hatchery			
Rainbow trout (put-and-take)	8-10"	30	(hatchery released)
Rainbow trout (wild)	8-12"	5	
Whitefish	4"	13	
Suckers	4"	14	
Suckers	2"	1	
Squawfish	3"	4	
Lower Section: McCall sewage ponds effluent to Sheep Bridge (directly west of McCall smoke jumper base)			
Rainbow trout (put-and-take)	8-10"	3	
Rainbow trout (wild)	10"	1	
Rainbow trout (wild)	6-8"	2	(possible fingerling plant)
Rainbow trout (wild)	3-4"	5	
Whitefish	3-5"	939	
Whitefish	8-14"	356	
Squawfish	2-7"	65	
Squawfish	16"	1	
Suckers	2-6"	75	
Suckers	14-16"	2	
Redside shiner		535	
Dace		25	

DISCUSSION

North Fork Payette River above Payette Lake

Since 1989, the total spawning run has increased in both numbers (120%) and biomass (138%) (Table 3). The total biomass of the 1992 spawning run increased by 25 percent from 1991. The average size of kokanee spawners decreased from 1991.

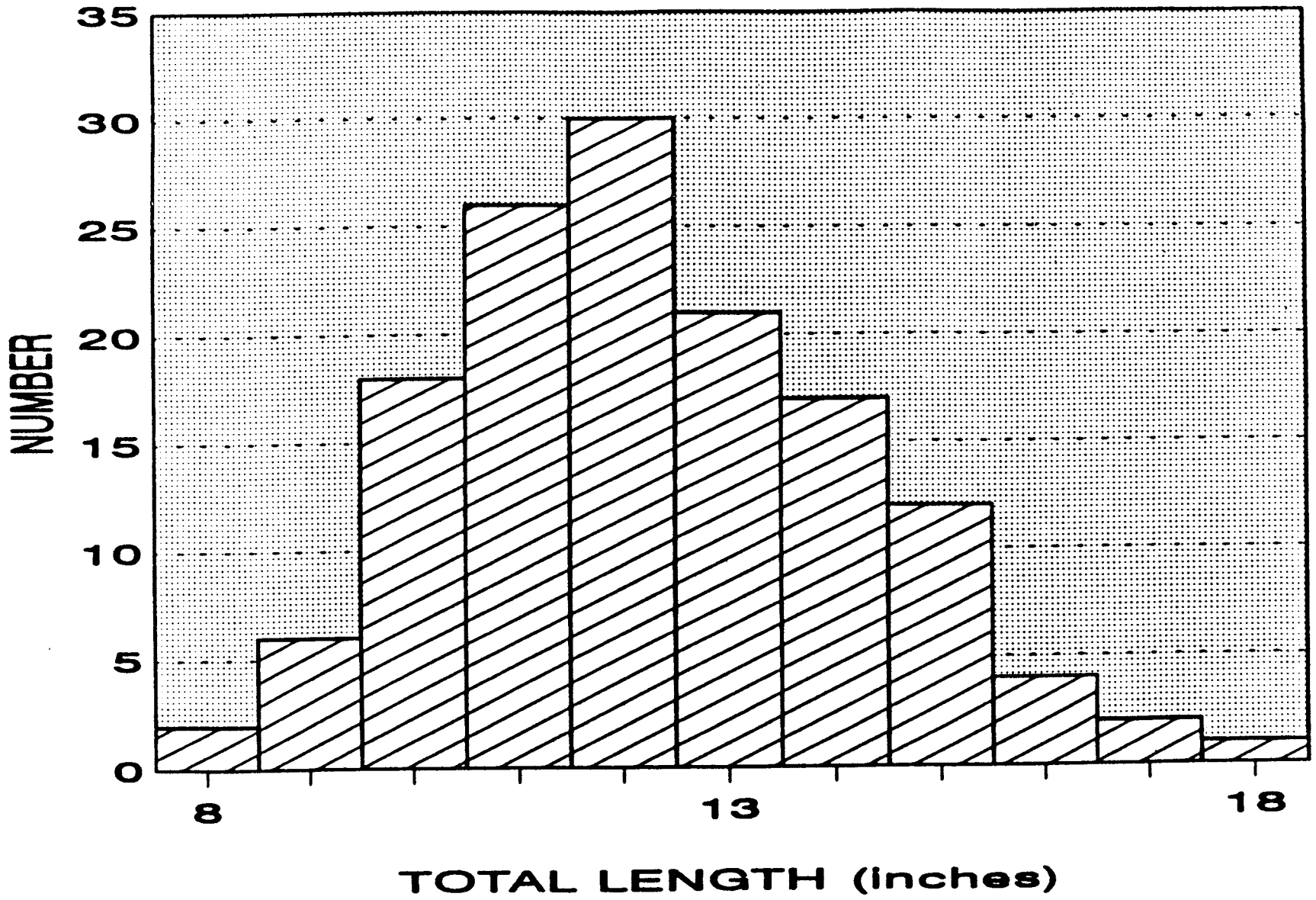

Figure 1. Length frequencies of cutthroat trout collected from Big Creek by hook and line in June 1992.

Table 3. Total estimated spawning run sizes, lake biomass estimates of spawners (1,715 hectare), and estimated number of spawners/lake hectare using unadjusted doubled peak spawning counts.

Year	Peak Count	Estimated Spawners	kg/Hectare	Number/Hectare	Grams/Fish
1988	13,200	26,400	5.3	15.4	346
1989	8,400	16,800	3.4	9.8	349
1990	9,600	19,200	4.0	11.2	358
1991	10,400	20,800	6.1	12.1	505
1992	18,541	37,000	7.2	19.0	377
1992	adjusted	32,560	8.1	21.6	

The 1992 spawning run was 1.4 times larger than the largest recorded since 1988. The 1992 spawning run was the first run in which we could follow a cohort from spawners (1988) to progeny spawners (1992). The 1988 spawning run estimate of 26,400 fish produced a spawning run of an estimated 37,000 fish in 1992, an increase of 40 percent. For every spawner in 1988, 1.4 spawners returned in 1992. Total biomass of the spawning run also increased from 5.3 kg/hectare in 1988 to 8.1 kg/hectare in 1992.

Big Creek

The Big Creek fishery has changed little since the last informal examination in 1990. Length frequencies of cutthroat trout are virtually the same as that found in 1990 (Janssen 1992).

North Fork Payette River below Payette Lake

The fingerling rainbow trout stocking in this stretch of river failed. The lack of salmonid habitat in this stretch of river was obvious. The river was wide and shallow, with pools and overhead cover very sparse. The river substrate was primarily embedded cobble with sand and silt in the few pool and slack water areas. Due to the condition of habitat in the North Fork Payette River through the city of McCall, it is unlikely we will ever see any significant numbers of salmonids.

RECOMMENDATIONS

1. Continue to count kokanee spawner escapement in conjunction with the Payette Lake kokanee population trawling estimates.
2. Trap spawning kokanee to calibrate kokanee spawner counts and to help determine spawning success.
3. Pursue study of kokanee spawning success in the North Fork Payette River with a University graduate student.

LITERATURE CITED

Grunder, S.A., J.D. Linman, and D.R. Anderson. 1990. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-15. Idaho Department of Fish and Game, Boise.

Janssen, P.J. and D.R. Anderson. 1992. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-15. Idaho Department of Fish and Game, Boise.

Scully, R., and D.R. Anderson. 1989. Federal Aid in Fish Restoration. Regional Fisheries Management Investigations. Job Performance Report. Project F-71-R-12. Idaho Department of Fish and Game, Boise.

JOB PERFORMANCE REPORT

State of: Idaho Name: Regional Fishery Management Investigations

Project: F-71-R-17 Title: Region 3 (McCall) Technical Guidance

Job No.: 3 (Mc)-d

Period Covered: July 1, 1992 - June 30, 1993

ABSTRACT

McCall Subregion fishery management personnel responded to 265 requests and opportunities for technical input. Comments were provided to state and federal agencies on proposed activities for which they have regulatory authority. Advice and technical assistance were provided for private businesses and the public on activities associated with fish, or having impacts on fish populations or fish habitat. The major topics of involvement included stream channel alterations, mining, and land management planning.

We also gave presentations to schools, sportsmen's groups, and civic organizations. We answered many questions from the angling public on fishing opportunities, regulations, techniques, and specific waters.

Author:

Donald R. Anderson
Regional Fishery Manager

OBJECTIVES

1. To protect or minimize impacts to McCall area fisheries by providing technical fisheries input to government agencies with regulatory or land management authority.

2. To provide technical fisheries input, guidance, and advice to private entities and the general public.

3. To promote understanding of the environmental requirements of fish populations and appreciation of their values.

RESULTS

Table 1 lists the public and private entities and number of contracts and responses made for each during 1992.

Table 1. Summary of technical guidance responses and activities by McCall Subregion fisheries management personnel in 1992.

Agency or individuals	Number of responses
U.S. Army Corps of Engineers	3
U.S. Bureau of Land Management	10
U.S. Bureau of Reclamation	7
U.S. Environmental Protection Agency	1
U.S. Fish and Wildlife Service	6
U.S. Forest Service	36
U.S. Soil Conservation Service	18
National Marine Fisheries Service	8
Idaho Department of Health and Welfare	14
Idaho Department of Lands	16
Idaho Department of Parks and Recreation	4
Idaho Department of Transportation	1
Idaho Department of Water Resources	10
Idaho Outfitters & Guides Board	11
Health Districts	6
Hydroelectric developers	12
Private fish pond owners	17
Public meetings and presentations	25
Mining	4
County Commissions	12
LeBois Resort developers	14
Nez Perce Tribe	6
Little Salmon River spill contacts	10
Municipalities	9
Total	260

RECOMMENDATIONS

1. Continue to provide technical fisheries input to the entities which most affect fish populations.

2. Continue to provide technical guidance and advice to private interests and the general public.

3. Expand efforts to educate the public in the environmental requirements for fish.

JOB PERFORMANCE REPORT

State of: Idaho Name: Regional Fishery Management Investigations

Project: F-71-R-17 Title: Region 3 (McCall) Salmon and Steelhead Investigations

Job No.: 3(Mc)-e

Period Covered: July 1, 1992 to June 30, 1993

ABSTRACT

Region 3 (McCall) salmon and steelhead investigations data are incorporated in a separate statewide "Salmon and Steelhead Investigations" report.

Authors:

Paul J. Janssen
Regional Fishery Biologist

Donald R. Anderson
Regional Fishery Manager

Submitted by:

Joel J. Patterson
Fishery Technician

Paul J. Janssen
Regional Fishery Biologist

Donald R. Anderson
Regional Fishery Manager

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Chief
Fisheries Bureau

Al Van Vooren
State Fisheries Manager